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Vol. 38 **NOVEMBER, 1952** **No. 11**

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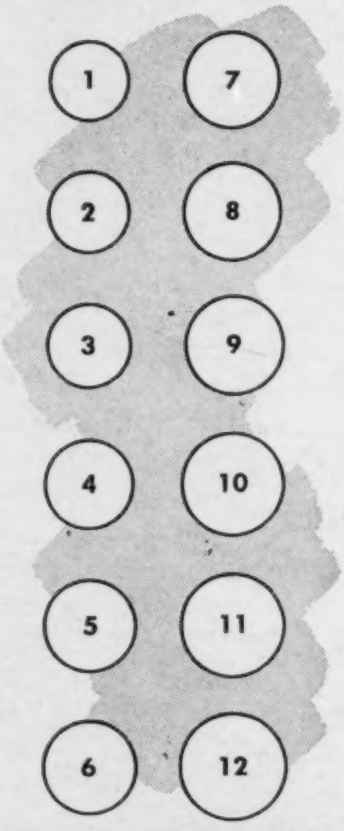

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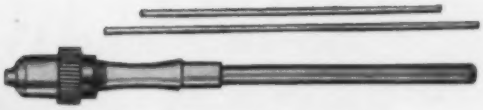

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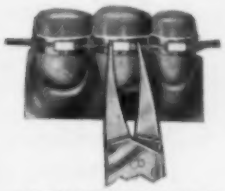

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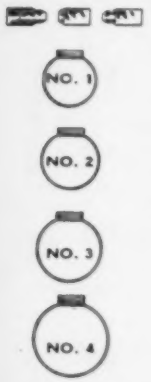

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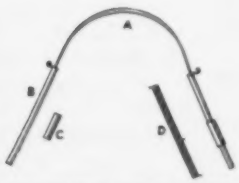

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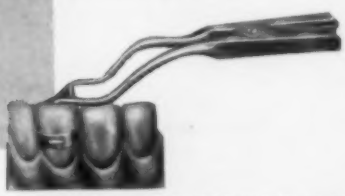

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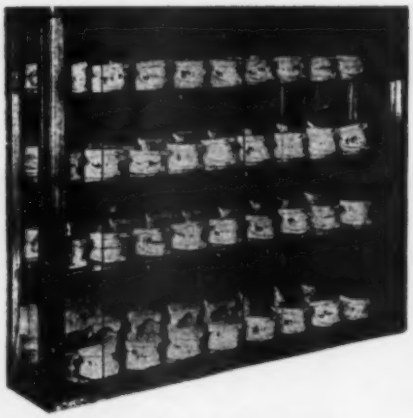

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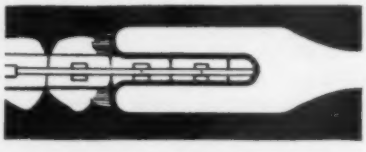

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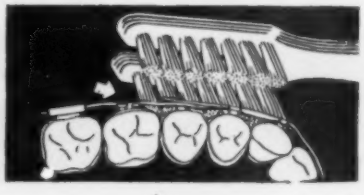

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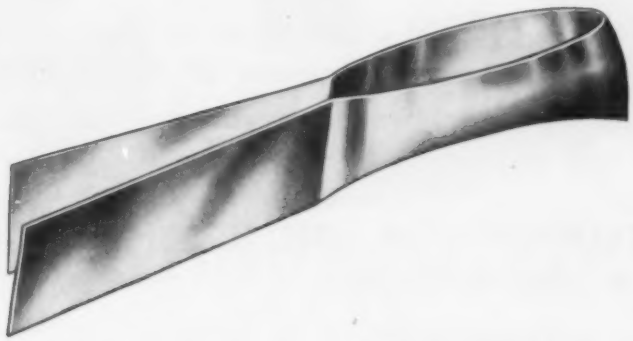

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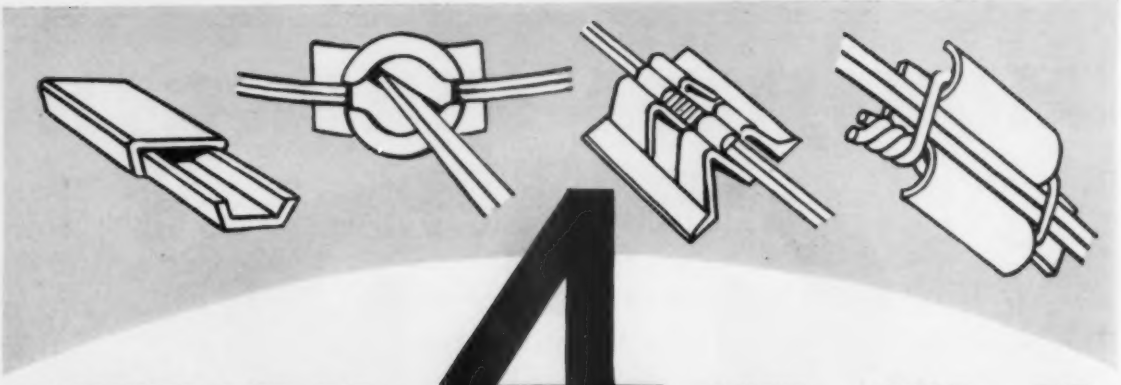

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American Journal
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ORTHODONTICS
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VOL. 38 NOVEMBER, 1952 No. 11

Original Articles

PRESIDENT'S ADDRESS, AMERICAN ASSOCIATION OF ORTHODONTISTS

BERNARD G. deVRIES, D.D.S., MINNEAPOLIS, MINN.

THIS is the forty-eighth session of the American Association of Orthodontists. The first session of the Association, then called the American Society of Orthodontists, was held in the rooms of the Missouri Historical Society in this same city of St. Louis in 1901. Had sessions been held every year, we would now be holding the fifty-second one. However, in the years 1934, 1943, 1945, and 1947 they were omitted. The 1951 convention in Louisville marked the fiftieth year of our Association's existence, so that, with the present session, we are entering the second half-century of its life. St. Louis holds the honor of being the first host to our Association and this session marks the sixth time that it has acted in that capacity. This will be the third time the Jefferson Hotel has extended to us its hospitality and facilities, and its halls and corridors have echoed to the voices and footsteps of some of the truly great pioneers in our profession. St. Louis does have a very special significance in relation to orthodontics, not only because it has welcomed us so frequently, but also more because of the great number of men of stature it has contributed and is still contributing to our profession. It can be designated as the birthplace of our organization, but progressive orthodontic thinking and major orthodontic activities within the boundaries of the old homestead are still surpassed in no other area. Indeed, the temptation to revel in historic data is great, but that material has already been published, some of it most adequately compiled by one of our members, Leuman M. Waugh, and recently published in the February issue of the JOURNAL.

As I interpret my assignment today, and it is an assignment, it shall be my responsibility to acquaint you with what I consider to be some of the more important matters concerning our organization. The assignment also affords the privilege of injecting whatever personal reflections I may deem to be germane to some of the points which shall be discussed. Not that a presiding officer's point of view shall always be construed as being the correct one, but it may be

Presented at the Forty-eighth Annual Meeting of the American Association of Orthodontists, St. Louis, Mo., April 21, 1952.

assumed that the nature of his position has at least afforded him a better than ordinary opportunity to perceive an over-all picture. The privilege of expressing his own thoughts must be considered as a true privilege, however, and not as a liberty of which to take advantage. Nor do I believe that each incoming president of our Association should feel compelled to propose great reforms, constitutional changes, and new plans of operation for our organization as a memorial to his stewardship. Rather, he should help to focus the thinking of the membership on some of the matters which he considers pertinent to the welfare of the association. My remarks shall be made with the foregoing in mind.

As you all know, the Board of Directors is the governing body of our Association. It is composed of the officers of the Association, elected directors from the constituent societies, and the chairmen of all elected committees. This is the first annual session at which eight sectional societies will be represented on the Board of Directors instead of seven. At the Louisville convention in 1951, a request for the organization of a new section to be known as the Middle Atlantic Section was approved by the Board of Directors. The area represented by this sectional society consists of Pennsylvania east of the Alleghenies, New Jersey, Delaware, Maryland, and the District of Columbia. The organization of the section was immediately undertaken and its first session was held at the Warwick Hotel in Philadelphia on Nov. 11, 1951. Thirty-four members were present, but a motion was carried to the effect that all others who were voted as members and who had paid their dues by March 1, 1952, were to be considered charter members of the new society. The officers elected were: George M. Anderson, President; Charles H. Patton, President-Elect; Raymond C. Sheridan, Vice-President; Gerard A. Devlin, Secretary-Treasurer; Stephen C. Hopkins, Editor; Emil O. Rosenast, Director; B. E. Erickson, Alternate Director. A. Wolfson, Andrew F. Jackson, and Earl Swinehart were elected to the Board of Censors for terms of one, two, and three years, respectively. The Constitution and Bylaws Committee of the American Association of Orthodontists, composed of Leo M. Shanley, Oren A. Oliver, and Philip E. Adams, Chairman, deserves special commendation for the effective and thorough manner in which the task of drawing up the Constitution and Bylaws for the newly created section and all other matters connected therewith was consummated. I take this opportunity to welcome the Middle Atlantic Section into the directorate of the American Association of Orthodontists and to extend to it warmest and most cordial wishes for its successful and happy operation through the years ahead.

The establishment of the Convention Planning Committee as a new elected committee of our Association also will add another member to our directorate. The purposes of this committee were delineated in published form and sent to each member prior to this meeting. This five-man committee has the important function of evaluating the facilities of possible locations for our annual conventions. Our Association is rapidly assuming a size which makes mandatory careful investigation of the adequacy of hotel accommodations, lecture rooms, exhibit space, et cetera, before a meeting place can be approved. In addition to that important duty, it is hoped that this committee shall give

due consideration to geographic locations in the best interests not only of the entire membership, but also the sectional societies. The Association has definitely outgrown that period in its development when our annual sessions simply followed the newly elected president home.

The reports of the major committees of the Association to which has been entrusted the implementation of its policies and directives are published subsequent to their annual presentation. Therefore, to inform you of their activities now is not indicated. I consider it fitting, however, to direct your attention to several areas in which the Association's activities have been especially noteworthy.

The one single department of the Association which operates constantly, month in and month out, is the AMERICAN JOURNAL OF ORTHODONTICS. Twelve times a year it reminds you that you belong to a functioning association. It is the official organ of our Association, its sectional societies, and the American Board of Orthodontics. The Publication and Editorial Board, the editor-in-chief, the associate editors, the staff of sectional editors, adequate secretarial assistance, and a cooperative publishing house all combine to provide us with the outstanding orthodontic journal in the world. Its circulation is world-wide and it is part of a universal professional literature which is accessible to the laity as well as the professions. During the past year the relationship between our Association, the JOURNAL management, and the publishing house has been established on a high level of cooperation. It must always be a prime obligation of the Association to maintain the highest degree of efficiency in all operations connected with the publication of our JOURNAL. A great responsibility falls upon everyone who plays a part in disseminating the printed word under the sponsorship of our Association. The acceptance or refusal of articles for publication, the wise or unwise use of illustrations, the encouragement or discouragement of contributors of original articles, and the maintenance of a fair, equable, and alert editorial policy are responsibilities not to be taken lightly. Our Association must never relax its watchful supervision of this most vital enterprise and entrust its operation only to those who are well aware of how costly mismanagement could be. At this time, I wish especially to commend our Editor and his associates for two unusually outstanding issues of the JOURNAL this year, the January issue, which was entirely devoted to orthodontic education, and the February issue, which contained a compilation of historical data of great value to our Association and to which I have already alluded.

It is my opinion that an editor should never be curtailed in the exercise of his prerogatives as an editor. If the Association is not satisfied with his administration it has the right to appoint another. All material to be published should funnel through his office at all times. There are, however, numerous occasions when he requires expressions of opinion from other staff members and this must be done largely through correspondence. I believe that a full and complete understanding of the policies and management of the JOURNAL by all of those connected with it is important. At the present time the personnel holds one meeting during the annual session of the Association,

those in attendance being the Publication and Editorial Board, the Editor, the associate editors, the sectional editors, and the secretary of the Association. It seems to me that this single meeting provides scant time for the entire staff to discuss matters of policy, iron out any differences of opinion which might exist, and promote a feeling of cooperation among all concerned. I would like to suggest that the groups just mentioned discuss the question of whether or not an additional annual meeting of the entire personnel would be of advantage in accomplishing the objectives referred to, as well as helping to indoctrinate new sectional editors and new members of the Publication and Editorial Board. The JOURNAL is a vital structure in our Association and the enthusiastic devotion which has characterized the men who have brought it to its present stature must be instilled by them into younger men who shall carry on. I know of no better way to do this than by personal contacts.

All of the committees of our Association are important, but at certain times one or another appears to be more so because of the timing of its activities. The Public Health Committee seems to be in this position now. There is a considerable volume of material in the reports of this committee for the past few years, all of which points to the fact that orthodontics has discovered that public responsibilities adhere to every profession which is engaged in what we term a health service. A perusal of the reports of the Public Health Committee will reveal to you that our Association is taking its part in cooperating with public health agencies in considering problems attendant to the projection of orthodontic care to large groups of the population. The progress of the Association's interest and cooperation along these lines is evidenced in the latest report of the Public Health Committee, which I urge you to read as soon as it is published.

In a meeting last fall of the Public Health Committee and other members of our Association with representatives of the United States Public Health Service and of the Children's Bureau, preliminary plans were discussed relative to fuller cooperation with Federal, State, and local health agencies in dealing with the orthodontic problem. At that time, in a letter to the Chairman of our Public Health Committee, your President stated the following: "It is important that those interested in public health, and more specifically its application to children, be definitely made aware that the American Association of Orthodontists wishes in no way to withhold its influence in elevating the health standards of American children. This is one of our prime objectives as an organization and for the American Association of Orthodontists to be left out of any and all deliberations concerned with child health would be a calamity. Our organization now stands ready to live up to its professional responsibility and wishes to help in guiding whatever policies may be developed later on." With these words I committed our organization in the field of public health. I trust that I have your approval.

Not all states have evidenced interest in dental malocclusions as a health problem. However, there is a creeping recognition on the part of the public of the significance of certain types of dental malocclusions as crippling de-

formities. Thus, public recognition alone, if nothing else, places orthodontics in the group of major health services. We cannot escape this responsibility and our assumption of it now indicates that when any state, through its health department, feels impelled to consider the problem of orthodontic services for the underprivileged, it will approach the orthodontic profession of that state. Any plan which is worked out must assure to the patient the highest quality of service within the limits of practicability and do justice to the operator and the profession of orthodontics itself. Such a plan, it seems, has been devised and is in operation in both the City and the State of New York.

The request to formulate an operable plan for the administration of orthodontic services to underprivileged children came *from* the State of New York *to* the orthodontists in the area. This is significant. The plan was worked out with the aid of outstanding orthodontists and has been in operation sufficiently long to give evidence of its practicability. The temptation is great to go into many of the organizational details, but time will not permit and they are published elsewhere. Correspondence with the Bureau of Dental Health of the Department of Health of the State of New York reveals such interesting statistics, however, that I cannot refrain from calling them to your attention. I quote from a recent letter from the Assistant Director of the Bureau. "By way of more recent statistical data, you will be interested to know that there are currently 712 cases under treatment in upstate New York and since New York City has at least as many, the figure for the state as a whole is about 1500. . . . It is further pointed out that of the 1500 cases under treatment, about 800 represent new cases, that is first-year cases. . . . The total cost of the program in New York State is now running well over 300,000 per year."

I have cited the operation of the New York plan for handling the problem in that area for the reason that many of you are unacquainted with it. The need for the services was felt to be so definitely established there that ways to provide it had to be devised. Requirements in other areas may be quite different and the need could reasonably be far less acute. The point is that here is an operable plan which can be studied in its application to other areas in which the crippling effects of certain types of dental malocclusions may become a major consideration by state departments of health.

At this point and apropos of the subject, I want to interject a short paragraph from the presidential address of Dr. Max E. Ernst in 1950 which sounds an admonitory note. We should heed it in our consideration of this subject. He says, "We should keep in mind that dental needs and services are, first of all, problems of the individual. If these needs cannot be met by the individual, it becomes a community problem and then that of the state. Only when the state cannot meet the health needs of its citizens adequately should the federal government assume such obligations."

I recommend that all of you study the reports which your Public Health Committee submits. This committee is representing all of us in its efforts to maintain our profession in an authoritative position in matters pertaining to public health and is seeing to it that in no wise can we be considered negligent in the assumption of our sociological responsibilities. This is not a time to be found lacking in this respect.

One of the committees whose duties are less spectacular than some others is our Nomenclature Committee. The work of this committee, however, is highly important. A sound and properly descriptive terminology is basic to all of the physical sciences, for they are interrelated. It is illogical that any single scientific group should employ descriptive words and phrases which are not in alignment with those universally accepted and utilized. Our literature reveals the confusion which exists in orthodontic nomenclature and terminology. Certainly our position in the field of physical sciences warrants the adoption and universal use of terms which are properly and scientifically descriptive. It is time that we eliminate from our literature words and terms which have no recommendation for their use other than their constant reiteration during the past half-century.

In a recent letter, Dr. Preis, of Baltimore, the chairman of this committee, stated that the committee felt the best approach for this year would be to serve as a liaison and advisory group to the American Dental Association's Library and Indexing Committee. That the American Dental Association now is well aware of the importance of a sincere study of nomenclature is indicated by a conference which is to be called in June, 1952. This conference is known as the Conference on Dental Nomenclature under the chairmanship of Dr. Donald A. Washburn. The purposes of the conference are well defined in a circular sent out in February, 1952, to all individuals and committees interested in nomenclature, including our own Nomenclature Committee. The aims of the conference are clearly delineated, as well as the scope of the studies to be initiated. Lack of time prevents me from giving you the detail of the plan. It is evident, however, that the approach to the activities of the conference is well established and represents a well-integrated attempt to make a scientific study aimed at clarifying dental nomenclature. Your Association has caused all interested persons to be kept informed concerning the conference and I strongly recommend that our Nomenclature Committee be represented in its deliberations. I also urge that a deeper personal interest be taken in orthodontic nomenclature and terminology on the part of any and all of us who are building our professional literature.

I now wish to discuss with you for a few moments another activity which is becoming of increasing importance to our Association. I refer to the American Board of Orthodontics. It is not an integral part of our Association, for it operates under its own articles of incorporation and makes its own operating rules. Nevertheless, it was and is sponsored by our Association and the personnel of its directorate is controlled by the vote of our Association. Likewise, the Ketcham Award, which was established by the Board, is conferred upon its recipient with the "collaboration of the American Association of Orthodontists." Thus, it is obvious that the Board is a structure within a structure, but standing upon its own foundations.

It is my privilege to have served on the Board for many years. During that period of time, I watched it develop from an agency which, for a long while, was looked at askance by many of our members, into a body which

has added greatly to the dignity and effectiveness of orthodontics, especially in its relation to other professions and the public. It was the second of any and all professional certifying boards to be set up and certainly preceded all other dental boards of like character. During the years it has become increasingly evident that to be a diplomate of our certifying board carries a special significance. This is revealed by the attitudes of hospitals, public health organizations, and the military services toward our diplomates. That this would eventually come to pass may have been foreseen by its founders back in 1929. I question, however, if ever they could have foretold that now in 1952 414 of our members would have become diplomates of the Board which they created twenty-three years ago. This figure represents over 34 per cent of our active membership. This year alone certificates were granted to 60 individuals.

I can assure you that the work of the seven Directors of the American Board of Orthodontics is arduous. It is a continuous responsibility which grows as our profession grows. The men who comprise the Directorate devote from four to five days each year, immediately preceding our annual meetings, to the examination of candidates, but for many months of the year they are called upon to exercise care and judgment of the most responsible type. The qualities of broad-mindedness, tolerance, critical judgment, and fairness must be inherent in them or the structure that they represent will fall. In my opinion, it is not necessary that all sections of our Association be represented on the Directorate of the Board. Areas which logically could be considered for representation could better be those which possess the greater number of potential candidates for certification. Directors from such areas would have a better opportunity of assaying an applicant's personal status in his own community. However, in my opinion, the real basic qualities which a Director of the American Board of Orthodontics should possess far transcend his geographical location in regard to the political sections of our Association. The American Board of Orthodontics and our Association should not lose sight of this fact. To make the nomination and election of a man to fill a vacancy on the Board of Directors dependent upon any other criteria would be calamitous. Directorship on the American Board of Orthodontics should not be taken lightly and the Board itself holds within itself the power to keep its personnel on the highest plane of efficiency and integrity. Any subornation of its principles and purposes to political expediency will surely result in its deterioration as an authoritative tribunal.

From time to time the advisability of retaining a paid full-time secretary for our Association becomes a matter of more or less discussion. Attention is called to our steady growth and the many new contact points which our Association and the profession of orthodontics itself now has with the public. It is contended by some that only through the efforts and attention of a full-time secretary can the best interests of both the public and our Association be served. Conversely, the supposition would be that we are not effective under our present arrangement.

My conviction is that certain advantages are gained by employing a full-time secretary, but, at the present moment, they are far outweighed by the advantages under our present setup. First of all, the employment of a professional secretary at this time would impose a financial burden not commensurate with the probable advantages. It would eliminate an *esprit de corps* between all of the administrative officers and directorate of our Association which, at least in my opinion, is one of the strongest influences for the solidarity of our organization. Our secretary does receive an honorarium which, of course, is not an adequate recompense for his time and energy. It is not supposed to be. It is, however, a tangible evidence of appreciation for his extraordinary services in our behalf. The expenses of administering his office should not be paid from this honorarium and any expenses which he incurs in rendering his service more efficient are and should be assumed by the Association. I believe that the continuation of a liberal policy on the part of our Association will result in gaining most of the advantages which might be secured under a paid secretaryship, but it will also preserve personal relationships whose importance should not be overlooked. When that time and point are reached at which our elected secretaries and officers clearly see growing evidences of the inadequacy of our present arrangement, I feel the Association will take the proper steps to remedy the situation and then only after a complete analysis of the entire picture.

[At this point let me say it has been rather difficult to interject into the program, but I think this is an opportune time, the following: The above sentiments relative to the matter of a paid secretary were fully endorsed and subscribed to by the late George Moore. I am assuming that the majority of our membership realize that they are missing a familiar face up at the head table today, and it is of course because of the untimely death of George. We miss him very much; in fact, more organizations than ours will miss him. I wish to inform you at this time that we, your officers, are deeply aware of the debt we owe to George, and that a suitable memorial to his passing will be considered at our business meeting as read and presented by the Necrology Committee.]

At this annual session, you will be asked to vote on several changes in our Constitution and Bylaws. The majority of them have no special significance other than to produce a simplification of certain sections of our operating rules, the inclusion of a new committee, and description of changes in sectional areas. There are, however, two proposed changes in our Bylaws which have a more than casual significance. The first is the proposal to strike out at present Section 2 of Chapter XIV and substitute for it the following: "Constituent Societies shall accept and conform to the Constitution and By-Laws of the Association." The second proposal calls for the amendment of Section 6, Chapter XIV by striking out in the last line the words, "as high" and substituting the words, "the same." Chapter XIV, Section 6 as amended would read: "Section 6. The standards of eligibility for active members in the Constituent Society shall be the same as those in the Association."

As a rule, matters pertaining to our Constitution and Bylaws are of most serious concern to a comparatively small number of our members who have made a study of, and are conversant with, the Association's operation. In this instance, I feel it is important that you all should be informed concerning the significance of the proposals just mentioned. If the amendments are approved and adopted, it means that requirements for active membership in any section will be identical in all eight sections of the Association. If the amendments are not adopted, it may mean that any section, if it sees fit, might raise the requirements for active membership in its own section. Since the sections are the portals through which an individual gains active membership in our American Association of Orthodontists, it is obvious that if any section should raise its requirements for admission, it automatically would raise the requirements for that individual to become a member of our parent body. In other words, active membership in the American Association of Orthodontists, through that specific portal, would require higher qualifications than those required in other sections or portals.

Opponents of the proposed changes contend that each section should have the right to establish its own requirements for active membership in its section; that to refuse a section this right is undemocratic and comparable to governmental assumption of States' rights; that only by allowing this freedom in the sections can other sections be stimulated to do likewise and thus the entire plane of the requirements for active membership in our parent body gradually be raised. Proponents of the proposed changes contend that to make the requirements for active membership in our parent body higher in one portal than another is not fair and is equally undemocratic; that within the past two years we have already entirely revised and raised our requirements for active membership; that if local conditions in any one section seem to indicate that a raising of the standards for active membership is indicated, the Board of Directors of the Association could be petitioned to have the matter discussed after which action could be taken.

The foregoing is my interpretation of the potential effects of the approval or disapproval of the above-mentioned changes in our Constitution and Bylaws. As your presiding officer, I am attempting to clarify it for you so you may be enabled to give it perhaps more than casual consideration and be prepared to exercise your vote more intelligently.

Our profession is now entering the second half-century of its existence. That statement alone tends to make one instinctively glance backward and at the same time be impelled to look ahead. Today truly is the lens through which the past is projected upon the future. No two individuals see the same images through an identical glass, but, out of the kaleidoscope of varying thoughts and impressions, trends usually can be detected. One can only express his own deductions. To me it seems that the time has come when orthodontics has to begin to establish some guiding principles of practice; to clarify and codify its ideas of what does constitute accepted orthodontic practice. The past fifty years have witnessed an ever-increasing crescendo in the

development of skills, in the development of more and more scientific methods of analysis and diagnosis, of more critical examination of allied fields in their application to the gross problem of dental malocclusions and their treatment. The material is piling up and creating a far richer literature as evidence of our profession's advances. To correlate our findings and reduce them to some basic principles would appear to me to be of the greatest value to us now. If this could be accomplished, it would also help to make us better understood by our fellow-dentists, many of whom still may question some of the attitudes of orthodontics and orthodontists.

To reduce all thinking in a science to a series of rules and axioms is, of course, an impossibility, nor are any of us so naïve that we believe this can be done. However, unless orthodontic thinking sets for itself a target of trying to establish basic physiologic truths which would apply in the consideration of any and all dental malocclusions and their manner of treatment, we will still continue to go round and round, grasping this and relinquishing that and seeking the solutions of our problems from new prophets who arise from time to time. To attempt to correlate our thinking and establish basic principles must be a continuing process, an expressed aim in the program structure of our annual sessions, an intention to establish some degree of unity within our ranks. The nature of the program this year indicates an attempt to bring together individuals who present thinking from many different angles. None of them may entirely agree nor will all of you agree with the findings they present. Nevertheless, the essayists have been requested to present their views with the aim in view of establishing principles which, in their opinion, can be derived from the data. Substantiation of claims by authoritative data is the only method of separating fact from fancy. Let us recognize this.

The past fifty years have witnessed great advance in orthodontic education. The speed with which our specialty has made its impact upon dental education is remarkable. Witness the efforts being made education-wise by the Association's Committee on Education. There still remains, however, a lack of uniformity in the teaching of orthodontics. Our profession, demanding, as it does, a knowledge of pertinent basic sciences and high technical skill of its practitioners, poses unusual problems in education at both undergraduate and graduate levels. To resolve their solution to a formula acceptable to all schools and compatible with existing dental educational curricula is not an easy task and its desirability may even be questioned. At the present time, however, it may be observed that as long as there is a variability in mechanical skills demanded of students in various dental schools, so will we find a variability in the application of treatment procedures. Too great variability and too much emphasis upon the advantages of certain procedures or disadvantages of others can lead not only to the division of our specialty into groups, but also to public bewilderment. It is heartening to observe that our schools are constantly broadening the scientific base of orthodontic education and seeking to establish in the minds of their students proper bases for evaluating contemporary orthodontic thinking and treatment philosophy.

Whatever evidences of discord occasionally arise in the administration of our Association are usually attributable to personalities and individual differences of opinion. They can become serious locally and thus harm our entire organization. Only when such matters cannot be handled at the local level do they come to the attention of your Board of Directors and this is very infrequently. We must all remember that the very nature of our profession makes each one of us an egoist. As an organization we are made up of soloists and soloists usually look for sour notes from each other. But, like a symphony orchestra, we have to work together to produce our greatest achievements. Even the leaders of the main sections of an orchestra submerge themselves in the production of the finest tonal effects. And it is in those over-all effects that an orchestra is judged by the public. So it is with our Association, and, regardless of differences in our individual beliefs and opinions in matters of more or less importance, there should be respect for one another commensurate with the dignity of the profession itself.

Our sectional societies and even our parent association are still being vexed by problems which involve ethics. They invariably cause personal embarrassment. Questions of ethics should always be settled at the sectional level and promptly. This is a responsibility of the ethics committees of district and state dental associations, as well as similar committees in our orthodontic sections. The Principles of Ethics of the American Dental Association provide accepted rules of conduct which are clearly delineated. The authority of that association as well as our own may be invoked in determining the settlement of local problems.

There are, unfortunately, some types of infractions of the rules of ethics which are difficult to measure by any code and these cause trying situations to arise. In a recent address to the Central Section of our Association, I expressed my thinking on this point as follows: "Codes of Ethics were never devised for men who have an inherent respect for human relationships. They were devised for those who have never possessed or have lost an appreciation of any and all motives or aspirations save their own." The few who fall into this latter category will always be with us. They are not peculiar to orthodontics. They are in every walk of life. When their infractions can be measured by established rules, they must be summarily dealt with. Otherwise such individuals can only be tolerated and, we hope, eventually discover that the price they are paying for professional isolation is too great.

Your association is in sound condition. Our total membership is now 1,266. At this time we have 1,197 active members, 10 honorary, 19 affiliated, 17 service, and 23 retired members on our lists. Canada is represented by 39 members. The Canadian provinces are included in the basic sections of the Association. Our Canadian members, though living across an international border, are a very intrinsic part of our membership. An examination of our past and present program structure reveals that they are actively contributing much to our Association. The bonds that unite us must never be allowed to

become insecure. The financial status of our Association is also very sound and none of our activities have been handicapped because of inadequate financial support.

The committees which carry on the business of the Association during the year are to be commended for their devotion to their tasks. Every presiding officer is deeply indebted to them for whatever success may have been achieved during his incumbency. This applies to each and every committee, both elected and appointed, but, perhaps, a president feels most keenly his dependence upon his Program and his Local Arrangements Committees. Without the steadfast and loyal support of these two bodies, your president would be helpless indeed. Personally, I feel so appreciative of the support they have given me that I wish to acknowledge it publicly at this time. The welfare of your Association seems to have been the driving force which has imbued these groups and I am deeply grateful for what they have done for me. I wish that every member of our organization could have a similar experience for it would inculcate in him a love and respect for our Association which can be gained in no other way.

Our Association is fast developing a fine tradition. We can safely say that it has passed its adolescence and is attaining its maturity. Truly the faith in which this structure was founded is exemplified by this gathering today. As an organization, we have made mistakes and will continue to make them. That is human nature. Within our organization itself lies the power to unify and strengthen or to destroy, and you may be assured that if it ever loses its effectiveness it will be from forces within itself. Living up to our individual responsibilties and our corporate responsibility as a profession to the public are the foundation stones upon which the success of this Association rests. It is the obligation of every one to be aware of this.

I wish to thank all of the essayists and clinicians who contributed to the success of this meeting. The expenditure of time and energy in the preparation of papers and clinics is often overlooked by those of us who profit most. Likewise, I would like to express the thanks of the Association to the exhibitors who assist so materially in making our sessions successful and to the hotel management who have been extremely cooperative. It has been a pleasure to work with the officers of the Association, President-Elect Brooks Bell, Vice-President Malcolm Chipman, and Secretary-Treasurer George Moore. Most especially am I indebted to George Moore for his never-failing counsel and assistance throughout the year. To all visitors I extend a hearty welcome, especially those from foreign countries. I hope that they will profit from this session and extend the greetings of our Association to their confreres.

In closing, I want you to know how deeply I have appreciated the privilege of serving as your President for the past year. It is an office which I approached in sincere humility and almost in trepidation when I looked back upon the illustrious men who have brought this Association to its present stature. I shall be forever grateful to you for reposing your trust in me.

CONSIDERATION OF MUSCULATURE IN DIAGNOSIS, TREATMENT, AND RETENTION

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SINCE 1930, when Broadbent introduced his x-ray method of appraisal of the facial skeleton, the researches of the orthodontist have been largely restricted to this field. This seems always to be the response to the introduction of a new method of research. In this instance it has been accompanied by an almost complete neglect of fields which had previously claimed considerable attention, and which had witnessed the establishment of well-grounded tenets. Thus, in our absorption with such matters as the morphology of the facial skeleton, tooth placement, dentofacial relations, and the like, we have tended to neglect the processes which determine them. Even the changes which accompany the gradual development of the pattern, so beautifully portrayed in the Broadbent-Bolton studies, have been largely ignored in favor of norms which would permit the application of dogmatic or systematized clinical procedures.

Among the fields so neglected could be mentioned embryology, the response of the tissues to growth and to orthodontic forces, nutrition, function, habits, and the neuromuscular system, to list only a few. In all of these there have been significant basic developments which await only their application to orthodontic problems. Such application, however, will require the devoted labors of men who sense the value in new knowledge and who are not content with things as they are.

In a paper under a similar title delivered before this society two years ago I attempted to indicate the necessity for a grasp of the anatomy and physiology of musculature by the orthodontist. Restricted largely to a description of the normal muscular arrangement of the head and neck with a few clinical examples to make it more palatable, it was similar to many papers written by others in the past. To repeat that effort today, with different words, would be useless. Nor is it possible to introduce a mass of new evidence because such new evidence is not available. It is only possible to indicate certain areas, now largely neglected, which might be of value not only clinically but also might indicate possible fruitful areas for further study. It is proposed, therefore, to attempt a loose correlation between the various stages of denture growth, about which we feel we know a reasonable amount, and the growth and development in the musculature which accompany such changes, matters about which at present we know little. But before starting this attempt I should like to try to convey a concept about bone and muscle which seems to be emerging from recent research; a method of thinking about these two tissues which is quite at variance with that gained from most textbooks.

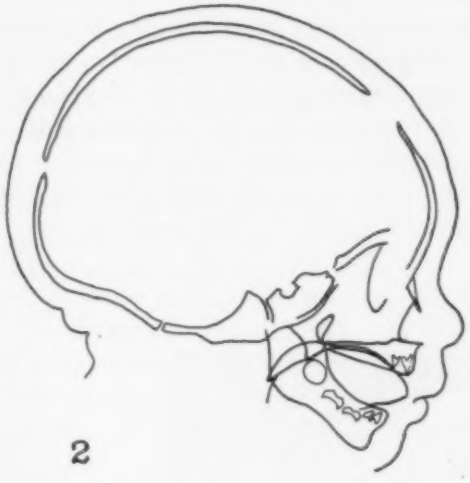
Presented at the Forty-eighth Annual Meeting of the American Association of Orthodontists, St. Louis, Mo., April 23, 1952.

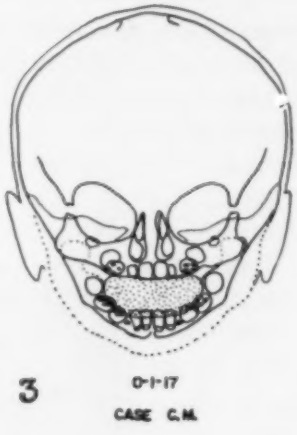
If one examines a cleared specimen of an early human fetus he notes that all organs are present in miniature and that fairly definitive form has been attained. Yet there is no sign of ossification. This process begins with the appearance of small centers, here and there, completely detached from each other and bearing no resemblances to the bones they will ultimately become. The impression is gained that the skeleton may be completely formed, perhaps in its final details, but that it has not been invaded as yet by the inorganic salts that will make it visible. The vitality and essential structure of bone resides in its organic elements, its cells, its fibers and its intercellular substance, and not in its inorganic constituents. These impart to it only its rigidity. Furthermore, whereas bones appear to be discrete entities, the connective tissue system of the body is a complex unity and the organic elements of the bones are integral parts of this unity. To state this in another way, the skeletal system, i.e., the bony framework of the body, represents, or is the pattern of, the past proliferative activity of the connective tissue system.

Fig. 1.—Drawing of frontal section of head in temporal region.

When we direct our thinking to the muscular system we find a somewhat similar condition, except that in this tissue we have the characteristics of irritability and contraction. Anatomical texts lead to a concept of a basic framework, the skeleton, the parts of which are moved by a complex system of elastic machines called muscles. Electromyography is tending to show that the skeletal system is secondary. The muscles are the important elements and bones are merely for the purposes of lending rigidity, changing the direction of action of muscle, or affording protection. We are accustomed to think of bones as being strong enough to carry, unassisted, the various functions to which they are assigned. This is true of only certain of them and these are all of the weight-bearing variety. In many other instances they would not be strong enough to carry their functional loads were it not for the assistance they receive from muscles. In these circumstances connective tissue and muscle work together.

As an example I should like to point to the zygomatic arch. This gives attachment to the entire masseter, one of the most powerful muscles in the body. Its force is exerted at right angles to the zygomatic arch. A moment's reflection would be enough to make one realize that a bone of this thickness could not withstand the force of this muscle without fracturing (Fig. 1). But





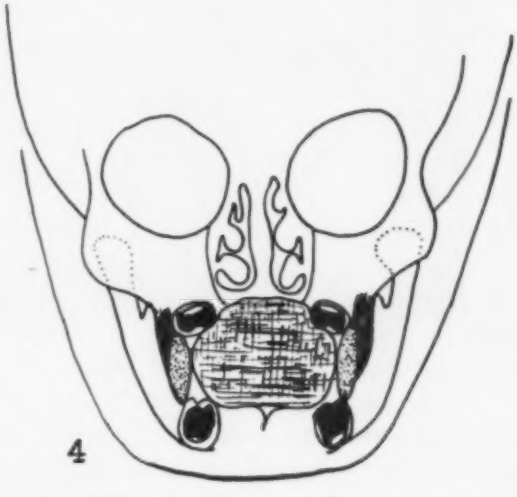


Fig. 2.—Lateral view of newborn head.
Fig. 3.—Frontal view of newborn head.
Fig. 4.—Diagrammatic drawing of frontal laminagraph.

the zygoma does not withstand this force unassisted. Covering the vault of the skull is a tough fibrous membrane which extends downward on the sides to cover the outer aspect of the temporalis muscle and gives that muscle a wide surface of origin. The inferior margin of the fascia is attached along the

entire superior margin of the zygomatic arch. Thus the pull of both the masseter and the temporalis muscles is resisted in large part by fascia running over the top of the head.

The truth of these assertions is shown in several ways. Some animals, with masseter muscles just as well developed as those in man, have incomplete zygomatic arches. In such cases the fascial covering apparently does most of the work of withstanding the pull of the muscles. Again, fractures of the zygoma in man which witness the breaking of a segment in the middle of the arch are not accompanied by any dragging down of the fragment such as would occur if the masseter were not resisted by some other agent. Further examples of this kind could be cited for a number of bones and for other structures controlled by muscles. All lead to the concept that the human skeleton has been reduced to the absolute minimum that will insure muscle function.

Turning now to the area in which the orthodontist works we find a repetition of the principles noted above (Fig. 2). The jaws of the newborn infant consist of nothing but troughs for the housing of the deciduous tooth germs, and these are widely separated from each other. The buccinator muscle at this time is attached close to the outer margins of the two troughs and the tongue occupies the entire mouth cavity (Fig. 3), flowing over the margins of the jaws and contacting the inner surfaces of the lips and cheeks. At this stage it represents a plunger in a muscular tube and its mere backward and forward motion makes it an admirable sucking mechanism (Fig. 4).

As the teeth of the deciduous set begin to erupt and as their alveolar process is formed to accompany them, the contact is broken between cheeks and lips on the one hand and tongue on the other. The teeth, once they emerge from their bony crypts, are completely at the mercy of their muscular environment so far as their buccolingual and labiolingual positions are concerned. Their arrangement will be determined by the equilibrium between the tongue on the inside and the lips and cheeks without. This condition obtains throughout life.

There are a number of factors that determine where this equilibrium will be established. One of the earliest to be manifested is the relative size and form of the tongue as compared to that of the jaws. In the interest of sucking and deglutition, the tongue is further developed at birth than all other parts of the head except the brain and the eyeball. Although its postnatal growth is, like those parts, very slow it may be too far ahead of the development of the jaws to make harmonious adjustment possible at this time. Under such circumstances a number of conditions may present themselves (Fig. 5). If the tongue is carried high and thus exerts its major force on the maxillary arch, we are likely to see an overexpanded maxilla and a mandibular arch that is completely enclosed by the upper upon closure. At rest, the tongue will be found resting on the occlusal surfaces of the lower teeth but lingual to the upper teeth. Such a tongue completely fills the vault of the mouth; hence with the overclosure of the jaws that occurs in such cases, the tongue is forced backward into the pharynx. Patients presenting these conditions in the

deciduous dentition exhibit marked occlusal abrasion of the teeth. They dislike closing the jaws in centric and particularly with food in the mouth, because they are likely to set up the gag reflex. Those who learn to adjust to the condition will be found to have an extremely wide lateral excursion which accounts for the excessive wear, and the parents will frequently report great difficulty at the time of weaning. The adjustment necessary to accommodate any form of diet other than liquids is too great, the tongue is forced back, a gag is set up, and the child regurgitates.

But a tongue lying at a normal level can also give rise to malformation of the arches if it is relatively advanced in development. In such cases there may not be overexpansion. Such tongues are frequently long and narrow and the tooth arch, conforming to it, is also long and narrow. In extreme cases of this sort the tongue may be too long to be carried inside the teeth and will project between those of the upper and lower jaws.

Fig. 5.

Fig. 6.

Fig. 5.—Complete buccal occlusion of upper arch due to high position of large tongue.
Fig. 6.—Front views of the models of a case of macroglossia taken one year apart and exhibiting spontaneous recovery without treatment.

It would be folly to attempt treatment of the condition just described at an early age, but the first, i.e., the overexpanded upper arch, should be managed as soon after it is discovered as possible. The aim here is to bring the upper and lower arches into such buccolingual relation with each other that they occlude upon closing and thus protect the tongue against crowding by overclosure.

In the case of the protrusive tongue, one can only await sufficient jaw growth and this can usually be detected by some subtle change in the arches.

In one case the tongue may act as though it were being retracted as in the macroglossia that resorbs spontaneously with the atrophy of the lymphoid ring or that of muscle fiber hypertrophy which may also resolve spontaneously. In other cases there may be no visible change until the pubertal growth spurt arrives when recovery may be dramatically rapid. Fig. 6 shows a case in which almost complete recovery occurred in one year's time at the age of 12. This was a girl. In still other cases the recovery of balance may be gradual and consume a period of years. Such a case is shown in Figs. 7 and 8. This was the case of a boy and complete resolution did not occur until the age of 14 years. The frontal tracings indicate vividly the effect of the tongue on the axial inclination of the canines. In cases like these the orthodontist can be quite confident that a balance will be reached before growth is finished because so-called macroglossia is rare in adults.

Another category of malocclusion which, although not *caused* by musculature is modified or made more severe by it, consists of those cases in which there is lack of harmony between the structures supporting the dental arches, either in degree of development or in position. The first of these, i.e., those presenting a difference in degree of development, is by far the more unfavorable in prognosis. Under this heading would fall such cases as bilateral or unilateral narrow upper arches, or lack of premaxillary development. To understand how musculature contributes to an unfavorable prognosis in such cases one has only to recall that the muscles which act as the restrainers of the dental arches are attached to the underdeveloped areas of the same bones that hold the teeth. In such cases only additional growth of the affected area can influence the musculature.

Lack of harmony between the *positions* of the two arches leads to a superimposing of muscular factors on the skeletal disharmony. This frequently occurs in Class II and Class III cases. Such malrelations necessitate muscular adaptations of various sorts which aggravate the condition. A few examples will serve to make this point clear.

Class II, Division 1 malocclusion is characterized by a mandible that is posterior to the maxilla (Fig. 9). The mutual support normally enjoyed by the two arches is lost in the anterior region particularly, and each comes under the influence of only a part of the total muscular complex that normally contributes to stability. The influence of the tongue on the lower arch is not lost but the restraining action of the lower lip on the upper incisors is. The upper lip is controlled by muscles which run to it from the mandible, that is, the retruded jaw. Under these conditions there is increased tension developed over the canine and this tooth is pressed palatally, narrowing the arch. The restraining force of the lower lip having been lost, the upper incisors fan out and the upper lip rolls back while the lower lip takes up its place beneath or behind the upper incisors.

Of recent years a good deal of research has been directed toward determining the differences between the Class II, Division 1 and the Class II, Division 2 facial patterns. While certain differences have been shown to be significant, they have by no means been striking enough to explain the char-

acteristic differences seen between the dental arrangement of these two malocclusions. These striking differences are largely restricted to the anterior portions of the arches and are in all probability largely attributable to musculature. In Class II, Division 2 cases the lower lip does not lose its control over the upper incisal area. The permanent central incisors, upon their eruption, immediately feel its influence and are guided into retruded positions, decreasing the size of the anterior arc and forcing the later erupting lateral incisors to take the marked labial inclination we all know so well. In neither the Division 1 or Division 2 types of Class II cases is it usually necessary to pay attention to a muscle training program in conjunction with treatment unless there is present some active habit. If treatment results in the establishment of Class I occlusal relations of the arches and jaws the lips seem to adjust to the normal relationships almost as rapidly as these are accomplished.

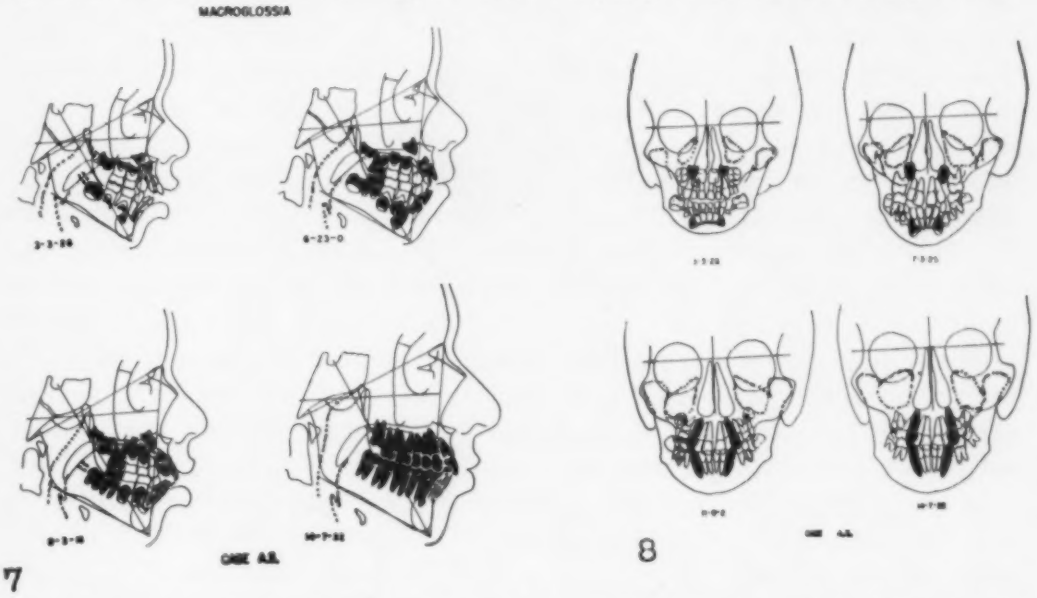


Fig. 7.—Tracings of lateral headplates of a case of macroglossia which did not resolve itself until the fourteenth year.

Fig. 8.—Tracings of frontal headplates of case shown in Fig. 7. Note the effect of the tongue on the axial inclination of the canines.

In Class III malocclusion we are dealing with a malrelation of the arches and jaws that is the opposite to that of Class II, but in addition we frequently find this accompanied by certain differences in development. This combination makes typical orthodontic management extremely difficult and frequently impossible. Studies of the morphology of the Class III pattern have failed to reveal significant differences in the absolute length of body or ramus of the mandible, but they have shown that the angle at which the two are connected is strikingly larger than in Class I or Class II cases. This leads to an increase in what has been called the effective length of the mandible, causing the protrusion so characteristic of these cases. This is frequently accompanied by a lack of maxillary development of varying degree which accentuates the intermaxillary discrepancy (Fig. 10).

In patterns such as these, the musculature, although perhaps normal itself, becomes a deforming factor through the abnormal manner in which it is forced to function. The hyoid bone and tongue are intimately associated structures and both are positioned in space by a three-point muscular suspension. The anterior point of this suspension is the symphysis of the mandible and the undue projection of this part brings about an atypical arrangement of the structures of the mouth and oropharynx. The tongue is usually

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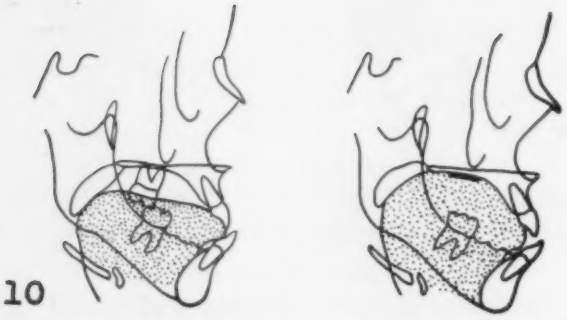

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Fig. 9.—Tracing of a typical Class II, Division 1 malocclusion with deranged musculature sketched in.

Fig. 10.—Tracing of lateral headplate of a Class III malocclusion showing (left) characteristic tongue position and (right) method of correcting tongue position by means of foreign object on the dorsum.

found at a lower level, its dorsum flattened and lying at the level of the occlusal surfaces of the lower teeth. Its bulk is completely withdrawn from the vault of the palate and expresses itself against the inner table of the mandible and against the lower dental arch. Both of these are usually unduly expanded while the maxillary arch is narrow and the vault high.

I have found that it is useless to treat a Class III malocclusion orthodontically unless it is possible to correct the tongue position at the same time.

This can be done only with the wholehearted cooperation of the patient throughout treatment and the period of retention; indeed it must lead to a new position of the tongue that is maintained even when the patient is not conscious of the effort. Its accomplishment and the rationale behind it are as follows:

The initial goal to be attained is to make the patient aware of proper tongue position, that is, of a position that finds the tongue in rather complete contact with the palate. This the Class III patient has never experienced. In mouth opening the tongue of the Class III patient follows the mandible down, whereas in the normal it tends to be retracted to some degree and to maintain a level somewhere between the upper and lower dental arches. All efforts must therefore be directed toward raising the mass of the tongue.

In order to make the patient aware of the difference between the habitual tongue position and that which it should be, it is necessary to introduce some small object that can be detected by both the tongue and the palate. This can be a small celluloid disk or the smallest sized rubber band. One of these is placed well back on the tongue and the patient is instructed to close the mouth and raise the dorsum of the tongue until the foreign body can be felt by the palate. Frequently it is necessary to spend considerable time at this stage in order to overcome the tendency for the patient to roll the object around until it is at the tip of the tongue when it can easily be placed against the palate.

Once the trick of holding the foreign object against the palate has been learned, the patient is instructed to open the mouth slowly while holding the rubber band or disk firmly against the palate with the tongue. This movement puts quite a strain on the superior posterior suspenders of the tongue, probably the styloglossus, stylohyoid, and glossopharyngeus muscles, and constitutes the exercise prescribed. After a day or so it is usually unnecessary to employ a foreign object because the patient by that time has become sufficiently conscious of tongue-palate contact not to require it. The exercises should be continued, however, until the tongue is held in correct position without conscious thought.

Before the widespread use of coordinated surgical procedures in the management of Class III malocclusion, many severe cases were treated in the clinic at the University of Illinois. The large majority of these, although showing little esthetic improvement in the face, maintained very satisfactory occlusal relations over the years in those individuals who managed to maintain their altered tongue positions.

As a final category should be mentioned those cases which exhibit various conditions of disturbed timing in growth and eruption. Mention was made earlier of precocious or early growth of the tongue associated with average growth of the jaws and eruption of the teeth. This would be an obvious case of nonsynchronous timing. There are others not so obvious. In the case of macroglossia we have a condition in which relations, or proportions, improve

steadily with growth but there are those in which, from a seemingly innocent beginning, conditions become steadily worse with growth. I shall try to explain what I mean.

Let us follow the events which occur in a case in which development or growth is lagging slightly behind the eruption of the permanent teeth and let us assume that the normal or typical order of eruption is being followed. The lower central and deciduous incisors are lost and their permanent successors may have some slight difficulty in arranging themselves. The maxillary permanent incisors follow in due time and appear to have little or no difficulty. But then the lower permanent lateral incisors, slightly larger than the lower central incisors, prove to have insufficient room and both the deciduous lateral incisors and canine are exfoliated. Now the stage is set for a chain of events which leads rapidly to conditions that will not correct themselves. The newly erupted incisors and the first deciduous molar go into the arc of a smaller circle and the incisors creep up the lingual surfaces of the maxillary teeth into a deep overbite. If any similar break occurs in the maxillary arch conditions are made worse by the decrease in size of that arch. Growth may subsequently express itself in the supporting bone of the arches but there will be no spontaneous recovery of the tooth arch as a result. The malocclusion that has been set up will be maintained largely by musculature and by function.

Little attention has been paid to the growth of muscle either as a tissue or as an organ, probably because of the difficulties of studying it, but it requires only a moment of reflection on certain easily observed facts to permit the statement of a few fundamental postulates. For instance, since growth occurs in bones, there must be growth in the muscles which connect them. If the growth of the connected bones is arrested, the muscles, although still capable of growth, do not increase in length. They do, however, maintain the same degree of tension that they had at the onset of the bone arrest.

We may transfer these postulates directly to the dental and alveolar arches if we bear certain modifying factors in mind. The first of these is that the chief binding muscle of the denture, namely, the buccinator, is attached to the jaws along a line that roughly demarcates alveolar process from skeletal bone. Its chief tensions are therefore expressed against the alveolar process and the teeth and mainly against the latter. Failure of the teeth to take their normal positions in the arch and thus lead to optimal arch length results in the adaptation of the labial and buccal musculature to this inadequate size. Thus the condition is perpetuated. Only the mechanical treatment of the malocclusion will serve to unlock the jam and permit the re-establishment of balanced relations. At the opposite extreme are those cases in which the muscles, instead of adapting to and perpetuating the malocclusion, may be the primary instigator. In this class should be listed all cases of hyperactivity whether due to tension or habit. So much has been written about habits in orthodontics that I do not propose to labor the question again. However, we have recently followed a patient in whom the effects of deranged muscle function were so clearly demonstrated that it is worth including in this presentation as an example (Fig. 11).

The case was that of a girl who presented at the University Clinic with a very severe lip-sucking habit, coupled with a hyperactive mentalis muscle. The lower anterior teeth were markedly retruded (right), although the upper arch was not disturbed. It was felt that if a way could be found to keep the lower lip from exercising lingual pressures on the lower incisors the case might correct itself spontaneously. A lower appliance was constructed accordingly which consisted of an arch upon which was mounted a plate or shield of acrylic material in the anterior region. This shield was placed and maintained in the same position as that which would have been occupied by the incisors had they been in normal positions, i.e., well forward of their retruded positions. This device was worn for a period of only a few months, at the end of which time the incisors were forward and perfectly aligned and the canines were erupting with ample space. Feeling that we had broken the habit successfully, a lower retainer was made consisting of canine bands connected with a wire to the lingual of the incisors (left), and the patient was released for a while. Upon her return we discovered to our dismay that although the lower six anterior teeth had maintained their relations with each other, the entire segment had been crowded back and had blocked the first premolars, which were erupting buccally to their normal position.

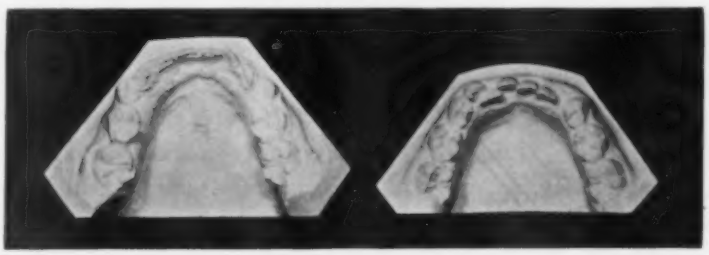

Fig. 11.—Occlusal views of dental arch of patient with extreme mentalis and lip-sucking habits (right) before treatment, and (left) after cuspid-to-cuspid lingual wire retainer had been worn for a short time.

SUMMARY

In summary it might be said that the teeth of the deciduous set are formed in those parts of the jaw that are essentially skeletal. Their pre-eruptive arrangement is controlled by the growth of the jaws which has usually proceeded to a degree which would permit the simultaneous eruption of the complete deciduous arch without crowding. Eruption witnesses their arising out of skeletal bone in which process they are accompanied by the development of alveolar bone.

Prior to the eruption of the teeth the jaws are separated from each other by a significant interval. The mouth cavity is completely filled by the tongue which contacts the inner surfaces of the cheeks. This contact is broken by the teeth as they erupt and approach those of the opposite jaw and the tooth arches and alveolar processes are molded by the pressures of muscle forces from within and without. At this early age the solid muscle mass of the tongue plays a dominant role and prevents any encroachment on its space

even though it may be greatly overdeveloped. Should it be in advance of jaw development this will be revealed by conditions that range from slight spacing of the teeth to the extrusion of most of the tip through the lips. If such oversize is coupled with a high position, there will be complete buccal occlusion of the upper arch.

Aside from the last-named condition no correction should be undertaken. This discrepancy between the size of the tongue on the one hand and the dental and alveolar arches on the other diminishes with age. Macroglossia is rare in the adult.

Following the completion of the deciduous dentition, the denture appears to enter a period of quiescence which is more apparent, however, than real. It is during this interval between the second and the sixth years that the jaws are being prepared by growth for the oncoming first permanent molars in back and the six larger anterior teeth. The face is being projected forward and is growing in height. The tongue is growing more slowly than the facial skeleton and the muscular drapery that constitutes the foundations of lips and cheeks is rapidly learning new functions which increase its activity. Pressures from without begin to gain ascendancy over pressures from within and it is during this stage that habits are first likely to show their effects.

With the loss of the first deciduous teeth and the eruption of their successors the denture enters its most critical period. Now the matters of timing and of eruption are likely to determine whether there will be adequate room for the alignment of the teeth and sometimes the x-rays reveal that the decision has been a close one. Those taken of an arch which exhibits the four permanent incisors, the deciduous canines, and the first and second deciduous molars will occasionally reveal a deep scallop in the mesial aspect of the canine root, indicating that during the early stage of eruption of the lateral incisor that tooth did not have sufficient room to erupt without destroying a part of the root of the deciduous canine. Growth has, however, rescued the case in time.

Observations such as these should lead us to question whether it would not be wise to instigate some form of treatment in those cases which do not quite make the grade. This could well be a simple lingual arch with finger springs to assist in opening the space, or sometimes merely a bite plane to prevent the overeruption and hence the locking by occlusion of a developing condition. The object of such treatment is not actually to move teeth, but merely to have some light force operating to take advantage of growth when it reaches an effective level. The neglect of such conditions not only permits them to become more severe, but also allows the accommodation of the musculature which then serves to perpetuate them.

The treatment of Class II cases, whether of the Division 1 or Division 2 variety, generally leads to the spontaneous correction of muscular malfunction, although complications may be present in addition to those inherent to malrelations of the jaws. The resting of the tongue on the incisal edges of the lower teeth, the wetting or biting of the lips, various sucking habits, and so forth, must be dealt with by any method that is consistent with normal

function. Thus, spurs on the lingual surfaces of lower incisor bands will frequently be found effective for the control of the tongue but should never be used where they will interfere with lip function. In the Class III case the prime requisite to success is the repositioning of the tongue, as has been described.

In closing it might be said that there is no magic way of handling the various muscular conditions that may be met in an orthodontic practice. To be successful one is forced to fall back constantly on his knowledge of normal anatomical relations, upon the various stages of development of the jaws and of tooth eruption, and upon what he knows of muscle physiology. Each of these factors exhibits a wide range of variability, so that the possibilities that may be encountered are infinite. However, the careful weighing of the possibilities in each case will usually give a clue to the proper approach and will indicate the most effective therapy.

808 South Wood St.

PRESENT BELIEFS IN THE PRACTICABILITY OF CEPHALOMETRIC STUDIES IN INDIVIDUAL CASE ANALYSIS, PROGNOSIS, AND TREATMENT

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IF A speaker on an occasion such as this is to keep faith with the program chairman, he will do well to accept entirely the title proposed for him to speak upon and do his level best to stay on the subject. I shall try to stay on the subject, and in all good faith I have accepted the title exactly as it was proposed. My mistake was to fail to inquire precisely what the title meant. Now, I am not pulling the leg of Dr. Ernst because the title is somewhat long, but I am attempting to point out that there is in that title a word which different ones of us may interpret differently—the word "practicability."

I shall assume that most of you are here because you know that when I am finished you will get to see the Ketcham Award presented to my fellow Californian, Dr. James David McCoy. But there may be a few unsuspecting souls who have drifted in hoping to hear that certain definite measurements might be taken from cephalometric films which would straightway enable them to deal more readily with some of the problems of orthodontic treatment. Perhaps these measurements would indicate whether or not it is necessary to extract, or perhaps what teeth to extract once that fundamental decision is made; perhaps they could indicate the necessity for banding second molars, or enable one to distinguish between malocclusions with a genetic background and those that are environmental in basis.

I do not want to imply that those are not good motives for listening to a paper at an orthodontic meeting, and I would be most happy to oblige you if I were able. Indeed, many of my various efforts at interpreting cephalometric films from the point of view of the orthodontist have been directed at those strictly utilitarian aims. We have heard so much in the last decade about the size of supporting bony structures as a determining factor in orthodontic problems that it would not be unreasonable to hope that some concrete leads in treatment planning should come directly from a procedure so admirably suited for measuring the size of the supporting bony structures. I shall continue my search for good, usable rules of thumb, and do so without apology, but I would be remiss in my duty if I were to imply to you this afternoon that the cephalometric procedure actually provides any such pat formulas for the solution of our common problems.

On the other hand, perhaps we may take a more liberal view of what can be considered practical and agree that even if immediate lines of action cannot be derived from cephalometry, if it increases our understanding of our problem, it is really a practical thing.

Presented at the Forty-eighth Annual Meeting of the American Association of Orthodontics, St. Louis, Mo., April 22, 1952.

*Professor of Orthodontics and Chairman of the Division, University of California.

Oriented head films provide a remarkably simple, and, in the long run, inexpensive means of documenting what is done in orthodontic treatment. They are within easy grasp of any orthodontist who wishes to avail himself of the advantages they afford. I want particularly to stress that it is desirable to have *many* different men in practice studying the problems of facial balance and the relation of the dental arches to their supporting structures. I am confident that more progress can come from this than can ever come from the tendency of the past to rely heavily upon the pronouncements of certain individuals as supposed leaders in the field whose word must not be challenged.

Charles Mayo has said, "It took the world from the day of its creation to the time of the sixteenth century to raise a doubting Thomas of sufficient mental strength and courage to state that questions were answered not by authority, but by experiment." I quote Dr. Mayo with approbation so far as his disrespect for authority is concerned and hope that he would not resent my adding that objective observation, not necessarily experimental in nature, can lead us toward the facts and spare us the necessity for relying upon pronouncements of "Authority."

It is for this reason that I am not particularly alarmed, as some of my friends are, to see quite a variety of methods of assessment of cephalometric films in prevalent use. The procedures of Margolis are different from those of Downs, and still a somewhat different method is used at Northwestern, and it must be admitted that California has added to the multiplicity of procedures. Every one of these methods of appraisal has been created because someone has studied the problem of facial balance in terms of its meaning to the clinical orthodontist, and accordingly each method has been brought out to meet the needs and desires of a person sufficiently interested to experiment in the problem.

By this time I should be backing up my assertion that routine can be a healthy thing, and demonstrate furthermore that cephalometrics affords certain routine procedures; it would, indeed, be possible for me to run through the routine which my technician and I follow in assessing a patient at the outset of treatment, or at its conclusion. However, I have seen this attempted by others at least as well qualified as myself, and I have also seen the glazed look come over the eyes of their audience, so that I have no intentions of setting out on that journey myself.

You have all had the experience of asking directions in a strange city; if they are at all involved you are likely to have to inquire again before you get to your destination. Learning the steps of a particular method of head film evaluation is as easy as finding the way to Third and Main, but the best way to learn is to go ahead and try, not sit and listen to another fellow telling how he would do it. Today we are not even going to attempt it.

The truth of the matter is simply this: The routine application of cephalometrics to orthodontic practice requires firsthand knowledge of the subject; you are not likely to learn much about it by asking questions of those who have.

There is a growing number of orthodontists who use cephalometry routinely in the appraisal of patients, and I venture to predict that in a measure this number will subside, as certain ones drop out who expect too soon an immediate return on their investment in time. It seems equally likely, however, that there will always remain a considerable number who want this kind of information on their patients, even when the technique no longer is a novel one. Just where such information will be applicable I hope to develop later.

To attempt to make a case for cephalometry as a *necessary* adjunct to orthodontic practice is a losing battle. It cannot be shown, for instance, by getting out models, photographs, and other records, that the users of these films get better results than do those who do not take cephalometric records. It would be possible, since the number of nonusers is so large as compared to those using films, to make it seem by sheer weight of numbers that the nonusers are the better orthodontists. Actually, the only fair verdict arrived at upon this basis is that there is no discoverable significant difference between the two groups.

I can recommend the cephalometer to orthodontists on the same basis that I would recommend study of anatomy of the eye to fellow ophthalmologists, if I were a professor of that subject. The eye man does not study anatomy of the eye to avoid getting it mixed up with the ear, nor because he forgets from time to time its essential parts. He can rattle off descriptions of the eye, as given in anatomy texts, any time he is requested to do so. The eye man studies and reviews those things if only for what might vaguely be termed *background:* he is not looking for an immediate pay-off, and while he knows that his study does him good, he might find it difficult to say exactly how it is helping him. It is precisely on this basis that cephalometry is useful to orthodontists. This is not the idle statement of a college professor. There are at least two *exceedingly practical* orthodontists in San Francisco who perhaps owe their first interest in cephalometrics to me, who now look askance at me for my practice of leaving routine tracing and measurement of head films to a technician. It is their belief that they learn enough from tracing a film on each patient they treat that it is very much worth their while to do so, and that *I* am remiss for allowing someone else to perform these tasks for me. Certainly, then, there is justification for the question which we frequently hear, "Has the cephalometer become a necessity in orthodontic practice?"

The only answer appropriate at the present time, I think, is an emphatic "*No.*" Cephalometric films taken on the Broadbent-Bolton apparatus were a part of the records of every patient I treated as a student, of every patient begun in the orthodontic clinic at the University of California since 1944, and of every patient treated in my private practice in San Francisco. I am used to them, and I would be lost without them, but for me to say at the present time that these films are absolute necessities would be an insult to nine out of every ten men present in this room. I have seen too many splendid orthodontic results achieved by men who could not begin to evaluate cephalometric films, ever to argue that these men were practicing with inadequate records.

For an orthodontist to get up in open meeting and insist that his way is the only possible way to obtain orthodontic perfection and to reach eternal righteousness is to demonstrate a woeful lack of proportion.

Having said that I have seen some excellent orthodontic results arrived at by orthodontists who have yet to show any interest in cephalometry, let me also say that I have observed among some of them practices which I felt they would not have indulged in if head films were routinely used by them. I have also known them to believe wholeheartedly in concepts which I felt they could not believe if they were regularly assessing their patients by means of cephalometric x-rays. To give both sides full credit, it can be said that many of these practices and beliefs have since been abandoned, sometimes because of cephalometric evidence discrediting them, but more often because the empirical trial and error of clinical practice ultimately came to the same conclusion previously arrived at through cephalometric measurements.

Cephalometry is one way of systematizing orthodontic thinking. Let us briefly review developments in the systematizing of orthodontic facts, over the relatively brief period in which the specialty has stood as a distinct entity in dentistry.

Before Angle brought forth his classification of malocclusion, there were several other methods of classification and description recommended by different orthodontists. The chief objections to them were that they failed to see the whole masticatory apparatus as a functioning unit and became involved with minute descriptions of the irregularity of this and that tooth. I use the term "involved" advisedly, since there was another major criticism of some of these methods of classification—they were too complicated and had too many categories. Angle's contribution was truly a classification, if we accept as a definition of a classification the separation of all individuals possibly involved into the fewest practicable categories. By definition, a classification cannot at the same time be a complete description, for as it goes on to describe it ceases merely to classify. The Angle classification cleared away a lot of confusion and got men to thinking about the dental apparatus as a functioning mechanism.

Simon's photognathostatics was an important milestone in orthodontic practice on several counts. To the extent that orthodontic photographs are today adequate for the purpose intended, Simon deserves the major portion of credit. By devising a workable method of getting models and photographs into the same frame of reference, he made orthodontists conscious of the importance of the relation between the lens axis, the film, and certain anatomical planes in the patient's head. More fundamentally, he showed the importance of evaluating the dental apparatus in three planes of space and in relation to contiguous parts of the craniofacial anatomy.

What has cephalometry added to this picture of classification and description? Simply this: It retains the planes of reference previously regarded as important. It increases the factor of accuracy because one is no longer dependent upon the operator's determination of critical landmarks, by actually reproducing those landmarks in the film itself, along with all other

parts which are to be related to them. Most important of all, however, it reveals parts not previously shown in models or photographs: the underlying bony structures which in the living are draped with soft tissues and are shown either poorly or not at all by other forms of orthodontic records. It makes it possible in the process of classification and evaluation of the patient to include the underlying bony structures in the appraisal of the patient. But, are we to rest the claim of cephalometry simply on what it might possibly do in the realm of classification and description of the individual case? I would prefer not to. In spite of the earnest statements of the proponents of this and that system, I must say once again, I have seen too much excellent work at the hands of people who show a magnificent disregard for all methods of classification, for me to believe that the paper work is really the most important side of orthodontics. I believe it is possible to achieve a high percentage of successfully treated cases without subjecting each and every one to a cut-and-dried system of evaluation, just as I believe it possible to become a millionaire without first becoming a certified public accountant.

But let me now mention some points which an orthodontist can gain from the routine use of head films in orthodontic practice. First of all he will come to appreciate the infinite variety of the human face. He will soon learn that just as there can be no two fingerprints alike, so there can be no two faces alike, regardless of similarity in occlusion or in familial background. This is a fundamentally important point. Some leaders in our profession, both now and in the past, have been guilty of making things seem too simple as they have set forth their newest ideas. Too many of them have introduced their new method of diagnosis, their new philosophy of treatment, or their new appliance, with the implication that from here on in, thanks to ingenuity and hard work on their part, orthodontic cases are going to fall into neat categories with all the headaches and petty little problems banished forever. Whatever other faults the worker in cephalometrics may have, he seldom falls into this one. By getting a look at the underlying basal structures of the denture, and, still better, by measuring them, he realizes that one can seldom make a universal formula or a glib statement applying to all cases, since individual cases do not resemble one another sufficiently to make such a thing possible.

The contribution of Downs,[1] which won the prize in 1948, is an excellent illustration of how one man appreciates this range of variation and takes it into account in sizing up patients. Note particularly that Downs did not define normality with respect to each of the ten values as being *the average* for this group of excellent occlusions. He knew full well that no single measurement could be taken as a normal for every individual. Instead he established a range of variation which will occur in individuals who, unaided by the orthodontist, achieve normal occlusion. These ranges and those averages may be used by any one of us in assessing the individual patient to discover the extent to which his facial pattern corresponds with the ranges found in naturally occurring normal occlusion. To me the significance of Downs's contribution is first that he recognizes this variation, and that, furthermore, he

provides a quantitative expression which can be used not only in comparing the abnormal with the normal, but also in measuring changes brought about either through growth or treatment in one individual.

It is much easier to discuss fundamental growth processes and other subjects which can be organized into broad generalizations than it is in a relatively short period of time to discuss the evaluation of individual patients. A full appreciation of the value of any technique must come from repeated application of that technique to one's own patients. I say "one's own patients," for some of you might wonder why the research institutions presently in possession of cephalometric equipment should not continue to report, on occasions such as this, the fruits of their experience. This would seem to eliminate the necessity for installing more of these devices in places accessible to the private practitioner. There are several reasons why this will not bring the benefits of cephalometry to the everyday level as rapidly as one might wish. First of all, every orthodontist, with good reason, wonders whether the results might not have been different had *he* been treating the case. This is particularly true when one's own procedures are being criticized by someone else who presumes to investigate them. Second, there is the long-established principle which has been recognized as long as there have been laboratory courses in schools, namely, one learns by doing, and one learns far more from the things which he encounters firsthand than from the things which are told to him or demonstrated to him by others.

The importance of the underlying bony support of the teeth is being recognized in orthodontic circles more and more. Since roentgenography is the only technique whereby these structures can be recorded, and since size and proportion can be evaluated by x-ray methods only when the film, the tube, and the subject are precisely oriented toward one another, cephalometric roentgenography seems to have come unmistakably into its own as an orthodontic tool.

I reiterate my previous statement that at the present, and for some time to come, one may certainly practice good orthodontics without cephalometric roentgenography. On the other hand, if you choose to make statements in defense of your procedures which depend upon growth changes, or which involve alleged changes in the relationship of teeth to basal bone, you must not expect to be taken too seriously unless you document your statements with cephalometric evidence. It seems quite clear that the day is coming when such documentation will be offered routinely. I must say that I look upon that day with mixed feelings, for the reason that cephalometric technique involves far more than the possession of good intentions and sufficient funds to buy the equipment.

There is a variety of ways of interpreting tracings, and much room for disagreement. Undoubtedly doubtful treatment procedures will be recommended, backed up with well-intentioned but nonetheless misguided cephalometric evidence. Orthodontists have sometimes shown themselves to be a contentious lot, but I venture to predict that the differences of opinion brewed by cephalometric films in the next ten years will make previous ortho-

dontic brannigans seem tame by comparison. However, if the newcomers to the field appreciate that there are several things that must be learned, and if those of us more experienced maintain a flexibility of mind and do not act as if we had a pipe line from the Infinite, some interesting things ought to come of it and I for one hope to stick around for awhile to see how it all comes out.

Routine procedures, sometimes disparagingly called "formulas" can be exceedingly useful in bringing system to clinical procedures. These may be measurements made upon the model or evaluation of cephalometric films. It goes without saying that any rules derived from these procedures must be thoroughly and realistically tested and that the application of such rules can lead only to disappointment and disaster if such testing has not been carried out. Since my subject is cephalometrics I shall say that to date no effective course of action dictated by head films has yet been discovered; we shall continue to search, but as yet the tailor-made plan of treatment to go with a particular set of measurements has not been found. On the other hand, head films comprise a remarkably simple means of keeping day-to-day records on orthodontic patients, can be quickly taken and processed, and you file them as you would a letter. They give us, with a degree of precision unmatched by any other procedure, the ability to judge the relationship of the dental arches to their supporting bases and to assess any changes in that relationship which may or may not have been effected. Rapid methods of evaluation of facial pattern are available which serve to relate your patient with those having good occlusion and facial balance; if you elect to do so, you may delegate the tracing and measuring to someone else. We have reported at this meeting a procedure of evaluation which actually requires neither tracing nor measuring, but merely the use of transparencies.[2] Finally, I am pleased to report that thanks to the efforts of Vorhies and Adams,[3] I do not have to "think" to size up the results of the measurements my technician has made for me—the implications just jump out at me.

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REMOVAL OF A LOWER INCISOR

Report of a Case

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ALL of us have had extreme and difficult cases of malocclusion, some with extraction of premolars and some without, in the various classifications of Angle which required considerable dexterity and appliance manipulation. They have had a successful termination, both esthetically and functionally, not only for the operator but also for the patient. Particularly is this so in cases of maxillary protrusion with attendant facial disfigurement.

However, the case to be presented is neither spectacular nor complicated. Rather, it has been selected because of the type of diagnosis and approach to treatment planning. The appliance used will not be stressed as there are several different kinds which could accomplish the same end result, depending on the preference of the operator.

In a paper read before this society a few years ago, I mentioned the necessity of taking into consideration any discrepancy in tooth structure between the maxillary and mandibular dental units. This case will help to illustrate that point.

Spaces can be observed (Fig. 1) between the superior anterior teeth due mostly to the abnormally small lateral incisors. In the mandibular arch the incisors are crowded and rotated while the left cuspid does not have space for normal eruption. Also the overbite, although not extreme, is deeper than normal. Treatment was not instituted at this time since it was felt that by waiting for the remaining permanent teeth to erupt the discrepancy in tooth structure could not only be more accurately ascertained, but also the period of retention might be shortened. Furthermore, perhaps the overbite of the anterior teeth could better be controlled with the entire permanent dentition present.

Therefore, treatment was not begun until the patient was 12 years of age, at which time the inferior left central incisor was extracted (Fig. 2). This tooth was selected not only because some denuding of the labial surface was present but also because the inferior left cuspid was crowded out of normal position. By reducing the amount of tooth structure in the mandibular anterior segment it was expected that such a procedure would allow closing of the spaces in the maxillary anterior segment and proper alignment of the inferior anterior teeth. It will be noted (Fig. 2) that there was space mesial and distal to the superior right cuspid, while the left cuspid, although just starting to erupt, had much more space than required. This would dictate the eventual mesial movement of the maxillary left buccal segment which

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would, in turn, necessitate the same movement of the mandibular left buccal segment. These tooth movements on the left side would further justify the left incisor as the one to be extracted. No third molars were present.

Plan of Treatment.—

Maxillary: 1. Rotate the lateral incisors and first premolars. Close spaces as much as possible.

2. Rotate the cuspids when fully erupted (the roentgenograms revealed the left cuspid as badly rotated).

3. Open the bite, move the left buccal teeth mesially with the mandibular ones, and close any remaining spaces.

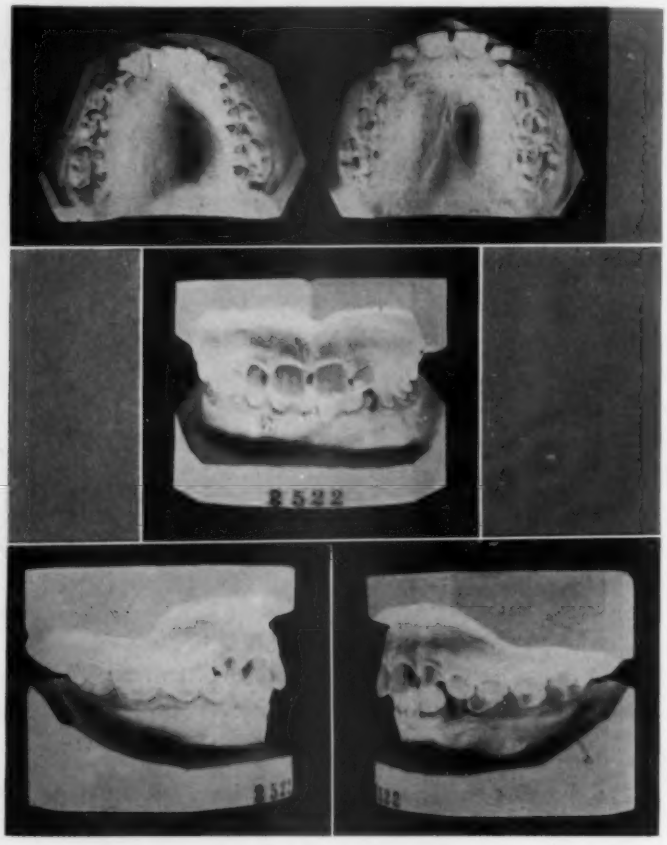

Fig. 1.—Case when first seen.

Mandibular: 1. Move the right incisors only slightly mesially and the left lateral incisor mesially into contact.

2. Move the left cuspid mesially and rotate.

3. Move the buccal teeth mesially on the left side with the maxillary ones.

Appliances to Be Used.—

Maxillary: 1. Full edgewise banding all teeth except the cuspids.

2. Band the cuspids when left one is fully erupted.

Mandibular: 1. Edgewise with bands on the six-year molars and three incisors.

2. Add bands to cuspids.

3. Full edgewise if necessary.

Mechanics of Treatment.—Appliances were placed as described with rotation springs soldered to the superior lateral incisor and first premolar bands. Round stainless steel arch wires, 0.018 inch, were placed on both arches with small complete loops incorporated mesial to the molar tubes to be used as stops or tiebacks. Stop spurs were soldered to the lower arch wire distal and adjacent to the brackets of the lateral incisor bands. The lower incisors moved

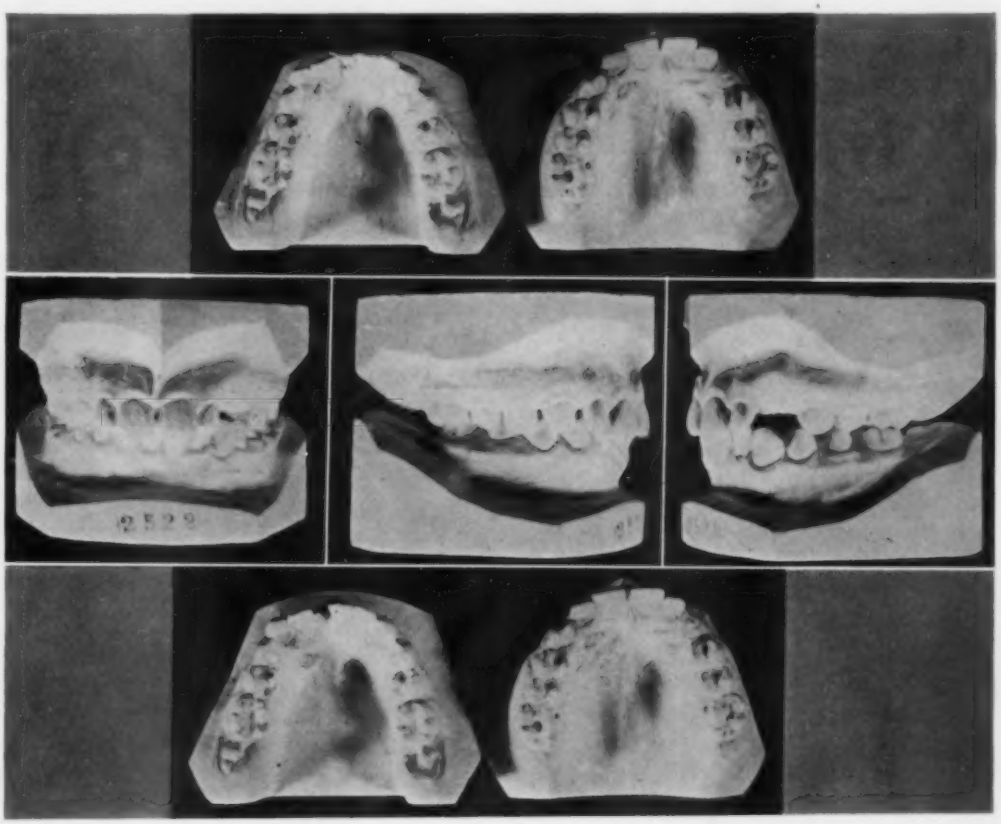

Fig. 2.—Models when treatment was started and after extraction of the mandibular left central incisor.

together so easily by resetting the stop spurs mesially (mostly the left one) that it was not necessary to use coil springs in place of the spurs. In less than three months the inferior incisors were all in contact and in good alignment. Meanwhile, the necessary rotations were performed on the maxillary teeth. When these preliminary movements were accomplished (three months) the patient departed to camp for the two summer months. Upon returning, the superior cuspids were fully erupted, so bands, with rotation springs soldered to them, were placed. While these teeth were being rotated, ligature wires

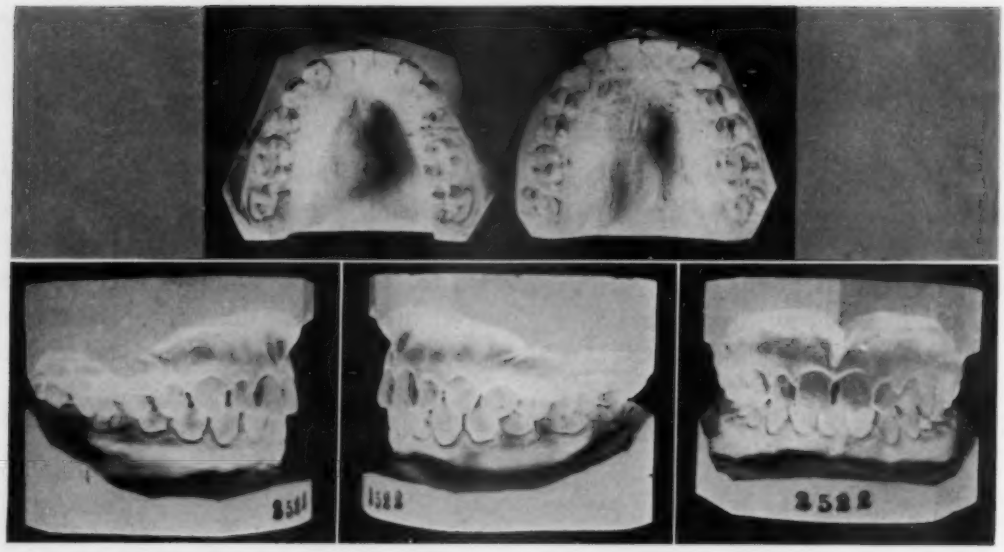

Fig. 3.—Case at the completion of active treatment.

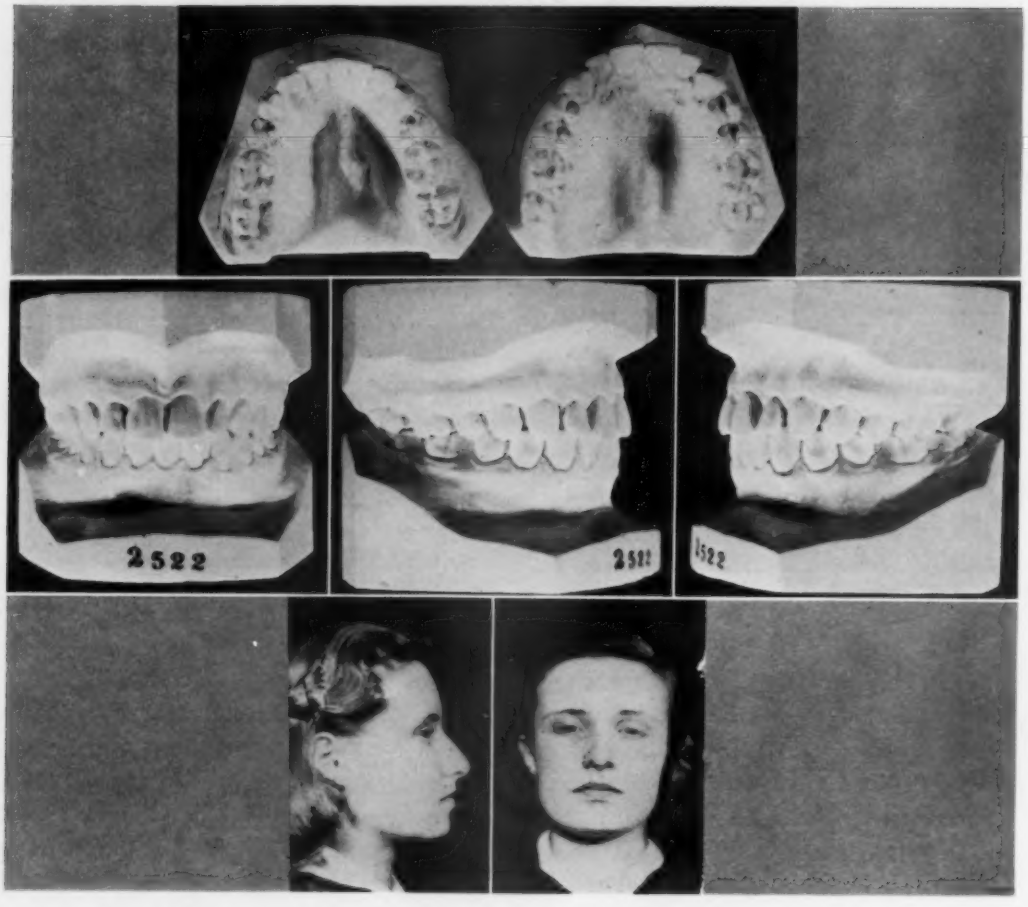

Fig. 4.—Models and photographs two and one-half years after treatment.

were tightened between the molar tubes and arch wire loops mesial to the tubes. This gradually closed the spaces remaining between the teeth. Tie-back bends and a full edgwise on the mandibular arch were not found necessary as the overbite which was not extreme was corrected by the use of straight arch wires, 0.018 inch round stainless steel. These round wires were used to allow free movement of the teeth while closing spaces. The above adjustments were carried on slowly from September to the following June when the patient again left for the summer. Upon returning in September the appliances were removed. The active treatment involved fourteen months with appliance adjustments made once every four weeks.

Retention.—A Hawley retaining plate was placed on the maxillary arch while no retainer was resorted to on the mandibular teeth. The plate was worn all the time (except during meals) for three months, after which time it was worn nights only for eight months.

At the completion of active treatment (Fig. 3) the inferior anterior teeth were found in good alignment with all spaces closed. Some slight spaces remained in the maxillary arch which could not further be corrected without disturbing the normal relationship of the buccal teeth or the corrected overbite (Fig. 3). Models and photographs were made (Fig. 4) two and one-half years after appliances were removed and one and one-half years after the maxillary retainer was removed. No retention was necessary on the mandibular arch.

CONCLUSIONS

The diagnosis, plan of treatment, and treatment objectives were achieved. No facial change was brought about by the extraction or subsequent treatment. The removal of the inferior incisor, as well as the slow movement of teeth, reduced the problem of retention. Due to the discrepancy in tooth structure between the maxillary and mandibular arches, extraction of the inferior incisor was justified.

133 Waterman St.

A STUDY OF INDIVIDUAL VARIATION IN MANDIBULAR BICANINE DIMENSION DURING GROWTH

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WITH a recognition of the interrelationship between growth changes in the dentofacial complex and the problem of orthodontic treatment, the orthodontist has become, in recent years, increasingly interested in a better understanding of these growth changes.

Among the investigators who have contributed to our knowledge of these problems are McDowell,[1] Waldo,[2] Krogman,[3] Cohen,[4] Goldstein and Stanton,[5] Sillman,[6] Lewis,[7] Broadbent,[9] Todd,[10] Hellman,[11] and many others. Most studies have been focused on average growth patterns and, although most investigators emphasize the individual variation from the average, few have attempted to correlate the variation. As Krogman[8] states: "The average is the exception; the variant, the rule."

The purpose of this investigation is to study the changes in mandibular arch width as represented by the bicanine dimension in a small group of children presenting both Class I and Class II (Angle) occlusions with specific reference to individual variability.

MATERIAL

The material comprises measurements upon 239 serial casts of 24 children selected from those studied at the Child Research Council in Denver, Colo. Both McDowell[1] and Waldo[2] have described these studies. The twenty-four children were selected to include twelve male children, six with Class I and six with Class II occlusion; and twelve female children, seven with Class I and five with Class II occlusion. The series utilized a range from two to twenty-one years, although some series end as early as thirteen years, nine months and one series begins as late as six years.

The distance between the lower canine from tip of cusp to tip of cusp as described by Cohen,[4] was measured with a vernier caliper to 0.1 mm. The margin of error was determined to be 0.5 mm. It must be noted in this regard that the casts measured were prepared from modeling compound impressions and the possibility of error by distortion of the impression cannot be ignored. As pointed out by Krogman,[3] "Measurements must be used by the sound interpretation that human biology is not amenable to the same type of precision that a chemist and a physicist uses in his work." Fig. 1 shows the points measured and the calipers employed.

To test the authenticity of the measurements made in this study, mean dimensions of $\overline{c|c}$ and $\overline{3|3}$ in male and in female patients were compiled.

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood it does not necessarily represent nor express the opinion of the Board.

Table I presents a comparison between these averages and those of Cohen[4] in a longitudinal study of 28 children.

A study of Table I shows a slightly larger increase in mean dimensions of the children considered in this study than in those studied by Cohen. This may be due to the small number of children included in each of these investigations and may also be influenced by the high percentage of malocclusions present in this study.

Fig. 1.

THE GROWTH SPURT IN MANDIBULAR BICANINE DIMENSION

It has been pointed out by many investigators, among whom are Goldstein and Stanton,[5] Sillman,[6] and Cohen,[4] that the bulk of increase in bicanine dimension occurs during a growth spurt from 5 to 8 years of age.

Although it is not apparent from a study of mean increases, these accelerated increases or spurts occur in the children studied at different ages at different rates, in varying amounts, and are of varying durations.

The age at which the growth spurt in this dimension begins, in the twelve male patients included in this investigation, varies from three years, eight months to seven years, ten months (a variation of four years, two months). The completion of the spurt varies from seven years to nine years, five months (a variation of two years, nine months). It seems advisable that some reference point be chosen from which to consider the accelerated rate of increase in the bicanine dimension. As there seems to be a relationship between the spurt and the eruption of the permanent incisors as pointed out by Lewis,[7]

TABLE I. COMPARISON OF MEAN MANDIBULAR BICANINE DIMENSIONS ESTABLISHED IN THIS STUDY AND THOSE OF COHEN[4] AT YEARLY INTERVALS

AGE IN YEARS	MEAN DIMENSIONS $\overline{3 \mid 3}$, THIS STUDY	MEAN DIMENSIONS $\overline{3 \mid 3}$, COHEN	AGE IN YEARS
	Males		
5	23.2	23.9	5.6
6	24.0	24.9	6.6
7	25.0	26.1	7.6
8	26.3	26.5	8.6
9	26.9	26.4	9.6
10	26.9	26.3	10.6
11	26.8	26.6	11.6
12	26.9	26.5	12.6
13	27.0	26.5	13.6
	Females		
5	23.0	22.7	5.6
6	23.4	23.6	6.6
7	24.5	24.6	7.6
8	25.3	25.1	8.6
9	25.7	25.5	9.6
10	25.9	25.6	10.6
11	25.9	25.5	11.6
12	26.5	25.5	12.6
13	26.2	25.3	13.6

Goldstein and Stanton,[5] and Cohen,[4] the time of eruption of the lower permanent central incisors was chosen as a reference point and is designated in the following graphs and charts as "E."

Table II provides a comparison between the beginning of the growth spurt in the twelve male patients according to chronological age and as centered on reference point "E."

TABLE II. BEGINNING OF GROWTH SPURT IN TWELVE MALE PATIENTS

IN RELATION TO ERUPTION OF $\overline{1 \mid 1}$ ("E")		IN RELATION TO CHRONOLOGICAL AGE	
YEARS	NUMBER OF CASES	YEARS	NUMBER OF CASES
"E" – 3 yr.	1	4	2
"E" – 2 yr.	2	5	3
"E" – 1 yr.	6	6	2
"E"	1	7	3
"E" + 1 yr.	0	8	1
"E" + 2 yr.	1		
No definite spurt	1		1

There is a closer grouping of the majority of the cases studied in the left-hand section of the table (that which is centered on reference point "E"). Six of twelve cases begin their spurt at "E"–1 year and eight of twelve cases begin at "E"–2 years to "E"–1 year, whereas in the right-hand section of the table, the largest number of cases to begin the spurt at any one time is three at 5 years of age.

It seems advantageous, therefore, to use the eruption of the lower permanent central incisors as a reference point rather than chronological age in this investigation.

Fig. 2, *A* and *B* present the mandibular bicanine dimension in twelve male patients at successive stages as related to reference point "*E*." These have

been divided into Class I (Fig. 2, *A*) and Class II occlusions (Fig. 2, *B*). Each curve is designated by the case number and henceforth will be referred to by that number.

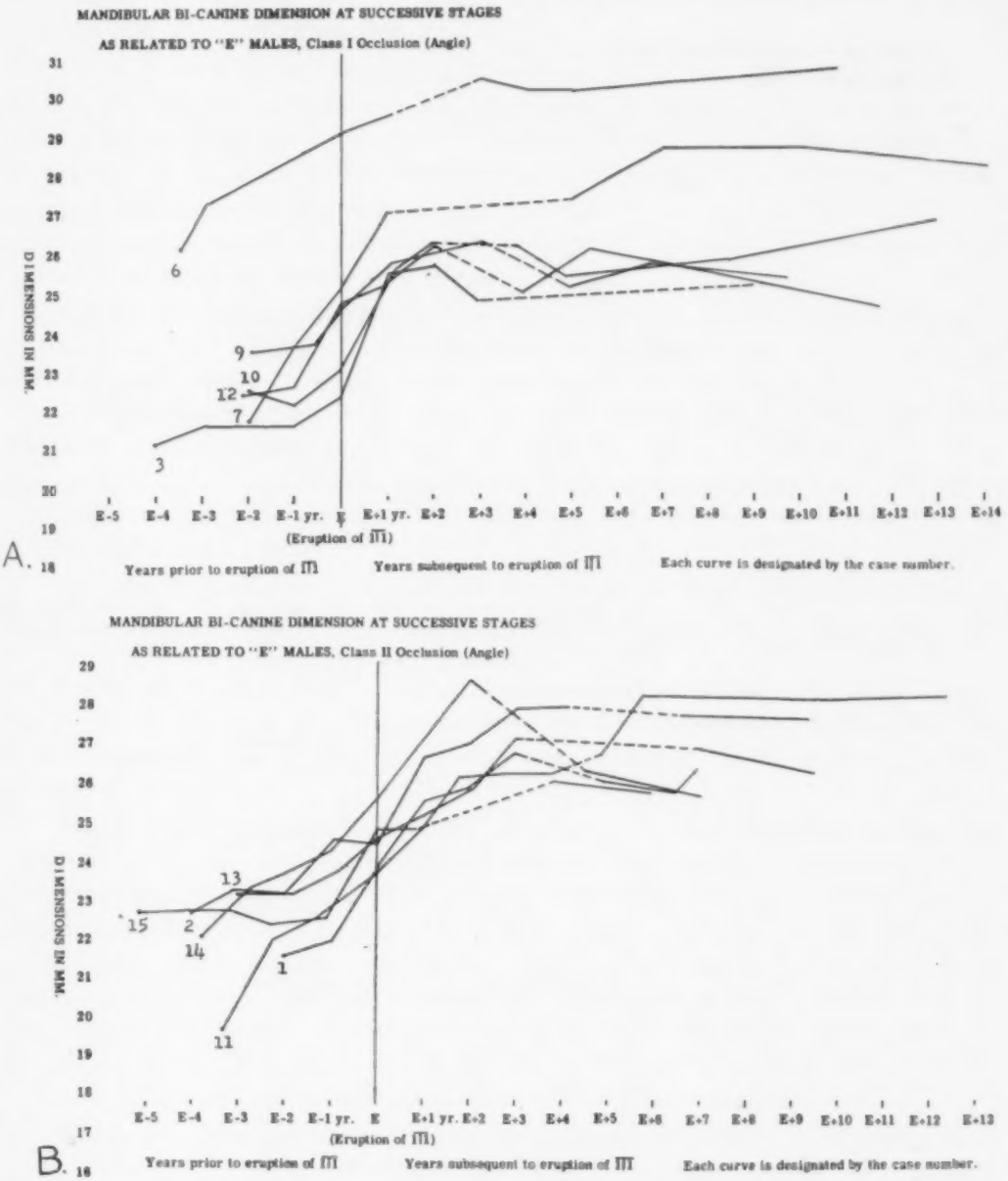
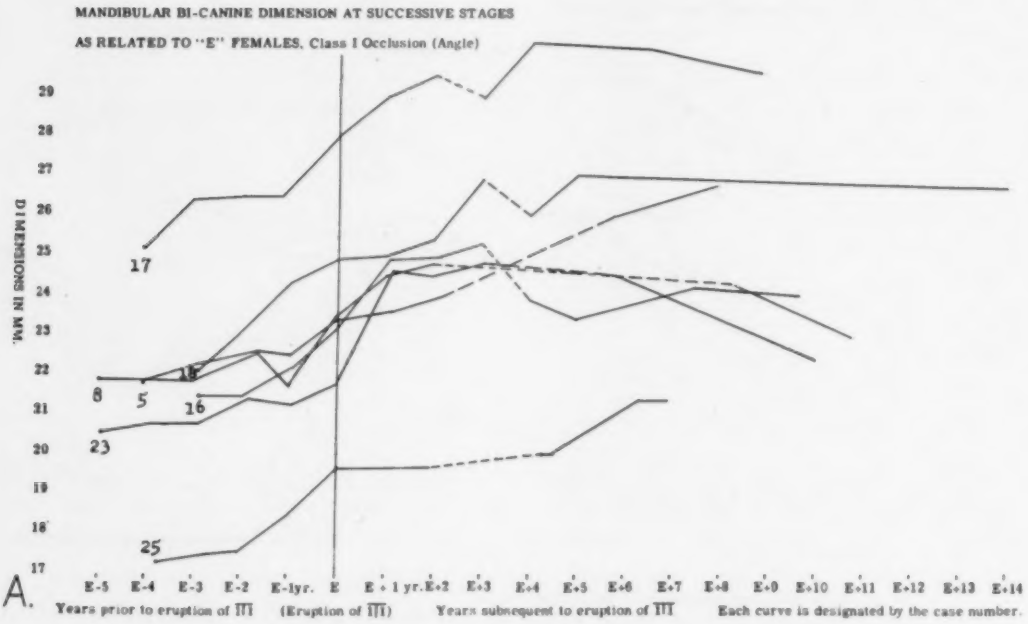

MANDIBULAR BI-CANINE DIMENSION AT SUCCESSIVE STAGES
AS RELATED TO "E" MALES, Class I Occlusion (Angle)
DIMENSIONS IN MM.
E-5 E-4 E-3 E-2 E-1 yr. E E+1 yr. E+2 E+3 E+4 E+5 E+6 E+7 E+8 E+9 E+10 E+11 E+12 E+13 E+14
(Eruption of $\overline{1|1}$)
Years prior to eruption of $\overline{1|1}$
Years subsequent to eruption of $\overline{1|1}$
Each curve is designated by the case number.
A.
MANDIBULAR BI-CANINE DIMENSION AT SUCCESSIVE STAGES
AS RELATED TO "E" MALES, Class II Occlusion (Angle)
DIMENSIONS IN MM.
E-5 E-4 E-3 E-2 E-1 yr. E E+1 yr. E+2 E+3 E+4 E+5 E+6 E+7 E+8 E+9 E+10 E+11 E+12 E+13
(Eruption of $\overline{1|1}$)
Years prior to eruption of $\overline{1|1}$
Years subsequent to eruption of $\overline{1|1}$
Each curve is designated by the case number.
B.

Fig. 2.

Five Class I male patients and six Class II male patients show an accelerated increase in dimension shortly before and after the eruption of $\overline{1|1}$ while one curve (No. 6) is characterized by a slower steady increase over a longer period of time. Two curves, No. 12 (Class I) and No. 2 (Class II), show an interruption of the spurt.

Fig. 3, *A* and *B* present the mandibular bicanine dimension in twelve female patients at successive stages as related to reference point "*E.*" These also have been divided into Class I occlusion (Fig. 3, *A*) and Class II occlusion (Fig. 3, *B*) and have been numbered in the same manner as in Fig. 2, *A*.



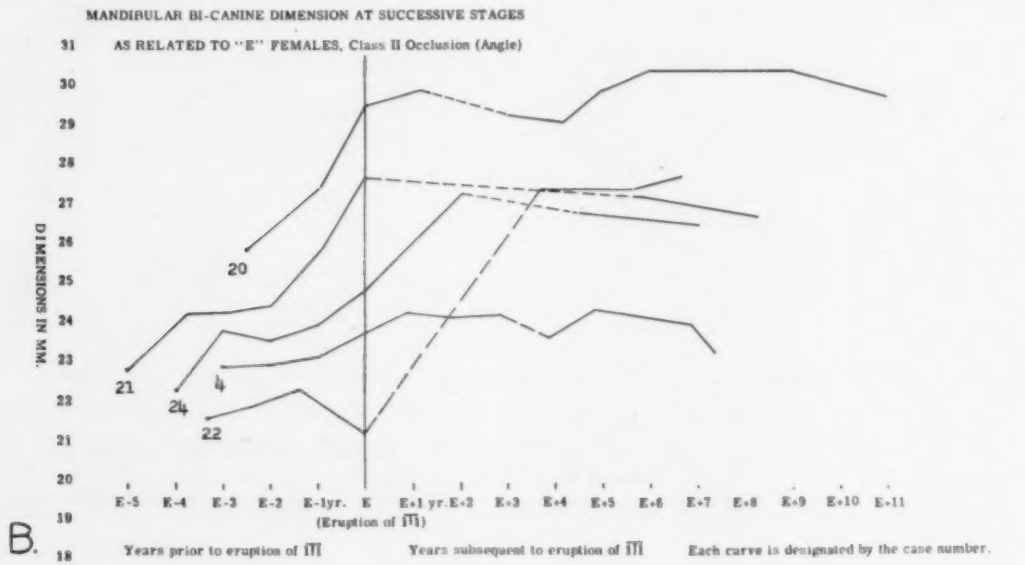


Fig. 3.

The female patients do not present as close a grouping as the male patients, particularly in the Class II group. However, the periods of accelerated increase in dimension are located, as in the male patients, on either side of reference point "*E.*"

TIME AND DURATION OF ACCELERATED INCREASE IN MANDIBULAR BICANINE DIMENSION

Tables III and IV will permit a more comprehensive study of the time of beginning, completion, and of the duration of the rapid increase or spurt in mandibular bicanine dimension.

It may be seen in the second column of Table III that Case 6 (Class I occlusion) presents no spurt. As previously mentioned, this case shows a strong steady increase from "E"–4 years to "E"+3 years. Case 7 begins the spurt at "E"–2 years or two years prior to the eruption of the lower permanent central incisors. Cases 9, 10, and 12 begin their spurt at "E"–1 year and Case 3 begins the accelerated increase at "E." It may be noted here that Case 23 presents an interrupted spurt.

Of the Class II male patients (column 4) one case, No. 11, begins the rapid increase at "E"–3 years. This spurt is interrupted from "E"–2 years to "E"–1 year. Case 2 begins at two years prior to the eruption of $\overline{1|1}$, and Case 13 also begins two years prior to "E." Three of the six Class II male patients studied, Cases 1, 14, and 15, begin the spurt at "E"–1 year. The totals in column 6 show that six of the twelve male patients observed begin the spurt at one year prior to "E" and that nine of the twelve start during the period "E"–2 years to "E."

The second section of Table III demonstrates that four of six Class I male patients studied ended the growth spurt one year after the eruption of $\overline{1|1}$, and that one case, No. 12 (interrupted spurt), at two years after "E." In the Class II male group, two patients complete the spurt at "E"+1 year and two at "E"+2 years. Nine of the twelve male patients studied end the accelerated increase in the bicanine dimension at one to two years after the eruption of $\overline{1|1}$.

In the third section of Table III it is noted that the duration of spurt in three of six Class I male patients is two years. One case has a duration of one year and one of three years. In the Class II group there are two cases of one-year duration, two of two years' duration, one of three years' duration, and one of four years' duration. Five of the twelve male patients studied show a spurt of two years' duration and ten of twelve had a spurt of from one to three years' duration. There seems to be a wider variation in the time of beginning and end of the spurt, as well as in the duration of the spurt in the Class II male patients investigated, than in the Class I male patients.

Table IV demonstrates a wider variation in the time of beginning and end of the spurt in Class II and Class I female patients studied than in the Class II and Class I male patients.

Four of seven Class I female patients begin their rapid increase at one year prior to "E," whereas the five Class II cases vary from "E"–3 years to "E" with one case showing no spurt. Four of seven Class I female patients ended the spurt at "E"+1 year and six of seven completed the rapid increment at "E" to "E"+1 year. Two Class II female patients completed the spurt at "E," one at "E"+2 years, and one at "E"+3 years. There is variation in the

TABLE III. MALE PATIENTS

BEGINNING OF SPURT						END OF SPURT						DURATION OF SPURT					
YEARS IN RELATION TO E	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	YEARS IN RELATION TO E	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	DURATION IN YEARS	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II
No spurt	#6	1			1	No spurt	#6	1			1	No spurt	#6	1			1
E – 3 years			#11*	1	1	E			#15	1	1	1 year	#3	1	#13, #15	2	3
E – 2 years	#7	1	#2*	1	2	E + 1 year	#3, #7, #9, #10	4	#1, #2	2	6	2 years	#9, #10, #12	3	#1, #2	2	5
E – 1 year	#9, #10, #12	3	#1, #14, #15	3	6	E + 2 years	#12	1	#11, #14	2	3	3 years	#7	1	#14	1	2
E	#3	1			1	E + 3 years			#13	1	1	4 years			#11*	1	1
E + 1 year																	
E + 2 years			#13	1	1												
Total		6		6	12	Total		6		6	12			6		6	12

"E" indicates eruption of $\overline{1|1}$.
refers to case number.
* signifies interrupted spurt.

TABLE IV. FEMALE PATIENTS

BEGINNING OF SPURT						END OF SPURT						DURATION OF SPURT					
YEARS IN RELATION TO E	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	YEARS IN RELATION TO E	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	DURATION IN YEARS	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II
No spurt			#4	1	1	No spurt			#4	1	1	No spurt			#4	1	1
E – 3 years	#18	1	#20	1	2	E – 1 year	#18	1			1	1 year	#5, #23	2			2
E – 2 years	#25	1	#21	1	2	E	#5, #25	2	#20, #21	2	4	2 years	#8, #16, #17, #18, #25	5	#21	1	6
E – 1 year	#5, #8, #16, #17	4	#24	1	5	E + 1	#8, #16, #17, #23	4			4	3 years			#20, #22, #24	3	3
"E"	#23	1	#22	1	2	E + 2			#24	1	1						
						E + 3			#22	1	1						
Totals		7		5	12			7		5	12			7		5	12

"E" indicates eruption of $\overline{1|1}$.
refers to case number.

time of beginning and end of the spurt in both Class I and Class II female patients studied, but the variation is greater in the Class II groups, both male and female, than in the Class I groups.

The difference in variation in duration of spurt noted between Class I and Class II male patients is also observed in the female patients. Five of seven Class I female patients studied show a two-year duration of spurt; the remaining two cases present a one-year spurt. Three of five Class II cases demonstrate a three-year spurt.

In a consideration of all Class I cases, male and female, it is noted that seven of the thirteen cases investigated present a rapid increase in bicanine dimension beginning one year prior to the eruption of $\overline{1|1}$, whereas the largest number of the eleven Class II cases studied to begin at any one time is four at "E"–1 year. Eight of the thirteen Class I male and female patients completed the spurt at "E"+1 year, whereas the largest number of the eleven Class II cases to end the spurt at any one point is three at "E" and three at "E"+2 years.

This greater variation in time of spurt in Class II cases as compared to Class I cases, noted in both male and female patients, becomes more obvious when the male and female patients are considered as a whole.

Eight of thirteen Class I male and female patients studied show a two-year duration of spurt, while the largest number of eleven Class II male and female patients to present the same duration in spurt is four (three years' duration). It is of interest to note that half the Class I male patients and the majority of Class I female patients begin their spurt at "E"–1 year and the majority of Class I female and male patients completed their spurt at "E"+1 year with a spurt duration of two years. In contrast, there are no majorities represented in the study of the behavior of Class II male and female patients in respect to time of beginning, completion, and of the duration of spurt.

INCREMENT IN MANDIBULAR BICANINE DIMENSION FROM THREE YEARS PRIOR TO ERUPTION OF THE PERMANENT LOWER CENTRAL INCISORS TO THE LOSS OF THE DECIDUOUS CANINES

The amount of increment in mandibular bicanine dimension by rapid increase varies as widely in each individual as does the time and duration of this spurt. This is demonstrated in Tables V and VI which present a comparison between the duration of spurt, the amount of increment during the spurt, the amount of increase in dimension other than by rapid increase and total increase during the period "E"–3 years to the loss of the lower deciduous canines. Average increase during spurt is 3.5 mm. Average increase to loss of $\overline{c|c}$ is 4.1 mm.

The amount of increase in dimension during the spurt in the one-year duration cases (Nos. 3, 13, and 15) varies from 1.3 mm. to 3.2 mm. The variation in those cases of two years' duration (Nos. 1, 2, 9, 10, and 12) is 2.1 mm. to 3.6 mm. Cases 7 and 11 which have a spurt of three years increase 5.4 mm. and 4.4 mm., respectively, while Case 11, with a spurt of four years' duration, increases 5.9 mm.

It is noted that in the twelve cases observed, the increase in bicanine dimension in the lower arch is greater during the spurt in those cases which demonstrate the longer duration.

Cases 3 (Class I) and 15 (Class II) which present a one-year spurt also show no other increase in dimension in the period "E"–3 years to loss of $\overline{c \mid c}$, while the third case in this duration group (No. 13) shows 2.7 mm. increase in addition to the spurt, bringing the total increment in this case to 4.0 mm. The five male patients in the two-year duration group show additional increase varying from 0.3 mm. in Case 10 to 1.6 mm. in Case 1. Of the two cases of three years' duration of spurt, Case 7 shows no other increase while Case 14 shows additional increment of 1.0 mm. Case 11, which has a spurt of four years' duration, shows additional increase of 0.7 mm.

TABLE V. INCREASE FROM "E"-3 YEARS TO LOSS OF $\overline{c \mid c}$ MALE PATIENTS

	CASE	INCREASE BY SPURT	OTHER INCREASES	LOSS	TOTAL INCREASE	DURATION OF SPURT
Class I	3	3.2	0.9	–0.9	3.2	1 year
	6	0	2.3	0	2.3	0 year
	7	5.4	0	0	5.4*	3 years
	9	2.1	0.8	–0.1	2.8*	2 years
	10	3.5	0.7	–0.4	3.8*	2 years
	12†	3.1	0.7	0	3.8*	2 years
Class II	1	3.6	1.6	0	5.2*	2 years
	2†	3.6	1.3	–0.4	4.5	2 years
	11†	5.9	0.7	0	6.6	4 years
	13	1.3	2.7	0	4.0	1 year
	14	4.4	1.0	0	5.4	3 years
	15	2.3	0.2	–0.4	2.1	1 year

All dimensions are in millimeters.
*Earliest model, E-2 years.
†Interrupted spurt.

To summarize, in the twelve male patients observed, it is noted that the three cases of one-year duration of spurt present a total increase from "E"–3 years to loss of $\overline{c \mid c}$ of from 2.1 to 4.0 mm. The five cases of two years' duration show a total increase of from 2.8 mm. to 6.6 mm. The two cases of three years' duration of spurt both show a total increase of 5.4 mm., and the case demonstrating a four-year spurt shows a total increment of 6.6 mm. It is also apparent that the six Class II cases show a generally greater increase both during the spurt and increment, other than by spurt, than do the Class I cases studied.

The Class II male patients studied also demonstrate a wider variation than do the Class I male patients, both in the amount of increase during spurt and in the total increment during the period "E"–3 years to loss of $\overline{c \mid c}$.

Table VI presents the same data for twelve female patients and shows a similar wider variation in spurt and total increment (from "E"–3 years to loss of $\overline{c \mid c}$) in the Class II cases studied than in the Class I cases.

Six of seven Class I female patients vary only 0.7 mm. in increase of dimension during spurt. A comparison of increases during spurt is impractical in the Class II group as only three of five cases studied demonstrate a rapid

increase during the period considered in the table. However, it is notable that these three cases present a greater increment during spurt than do the Class I female patients studied.

Both male and female patients show a generally greater increase during spurt in those cases in which a longer duration of spurt is demonstrated. However, the female patients with longer spurt fail to reflect a correspondingly greater total increment for the period "E"–3 years to loss of $\overline{c \mid c}$.

TABLE VI. INCREASE FROM "E"-3 YEARS TO LOSS OF $\overline{c \mid c}$, FEMALE PATIENTS

	CASE	INCREASE BY SPURT	OTHER INCREASES	LOSS	TOTAL INCREASE	DURATION OF SPURT
Class I	5	0.9	0.9	–0.1	1.7	1 year
	8	2.8	1.0	–0.8	3.0	2 years
	16	2.7	1.1	0	3.8	2 years
	17	2.5	0.6	0	3.1	2 years
	18	2.2	2.6	0	4.8	2 years
	23	2.8	1.5	–0.3	4.0	1 year
	25	2.1	0.1	0	2.2	2 years
Class II	4	0	1.5	–0.2	1.3	0 year
	20	3.7	0.4	0	4.1	3 years
	21	3.3	0.2	0	3.5	2 years
	22	0*	0.7	–1.1	–0.4	0 year
	24	3.6	0.3	–0.2	3.7	3 years

*An examination of Fig. 3, *B* will disclose that Case 22 does show a rapid increase in mandibular bicanine dimension. This spurt, however, takes place after the loss of the lower deciduous canines and must therefore be considered in this table as an absence of spurt.

CHANGES IN BICANINE DIMENSION SUBSEQUENT TO LOSS OF DECIDUOUS CANINES

In attempting to correlate the change in bicanine dimension subsequent to the loss of the lower deciduous canines, it was deemed advisable to consider it in relation to the previous changes already discussed. Tables VII and VIII, therefore, include not only the data describing the increase or decrease in dimension subsequent to the loss of the lower deciduous canines, but also that from "E"–3 years to that loss. These tables include data to two years subsequent to the eruption of the lower permanent canines. To simplify the study, all dimensions in Tables VII and VIII are converted to the nearest 0.5 mm. This conversion has resulted in a few discrepancies in total increments as compared with increases during different periods.

In considering Table VII it is seen in Section 1 that three of six Class I male patients show a rapid increase of 3.0 mm. to 3.5 mm., while the other two patientsi n this group presenting a definite spurt vary from 2.0 mm. to 55 mm. The Class II group demonstrates a wider variation of 1.5 mm. to 6.0 mm. although two cases show a spurt of 3.5. Eight of the twelve cases observed in both groups ranged from 2.5 mm. to 4.5 mm.

In comparing this with Table VIII it is seen that both male and female patients with Class II occlusion show a generally greater increase during spurt than those of the Class I group. Although the male patients demonstrate a correspondingly greater total increment in the Class II cases observed, this is not evident in a comparison of Class I and Class II female patients, and is therefore probably not significant.

In section 2 of Table VII, it is noted that five of six Class I male patients studied showed additional increase of from 0 to 0.5 mm. The only Class I case which demonstrated a significant increase other than during the spurt was Case 6 which had no definite spurt. The Class II cases, however, demonstrate increases other than during the spurt ranging from 0 to 2.5 mm., four of the six gaining from 1.0 mm. to 2.5 mm. Case 13 (Class II) with the smallest increase by spurt showed the greatest additional increment of 2.5 mm. Case 15, with the next smallest increase by spurt of the Class II group, showed no additional increment. Case 11 (Class II) which showed the greatest spurt showed no significant increase (0.5 mm.), and Case 2, with a spurt of 3.5 mm., gained an additional 1 mm. The significance of the large additional increase in Cases 13 and 6 following a small increment during spurt is lost in the lack of significant gain in Cases 9 and 15 which also showed a small increase during spurt.

In contrast to five of six Class I male patients studied who presented no significant increase other than spurt during the period "E"–3 years to the loss of $\overline{c \mid c}$, four of seven Class I female patients show an increase other than spurt of 1.0 mm. to 2.5 mm.

In comparing the Class II male patients with the Class II female patients studied, it is noted that although four of six male patients presented an increase in addition to spurt, four of five female patients failed to demonstrate any significant change in dimension.

The third section of Table VII presents the total increase from three years prior to the eruption of the lower central incisors to the loss of the lower deciduous canines. In this section we find that four of six Class I male patients increased 3.0 mm. to 4.5 mm. during this period, while four of six Class II male patients increased 4.0 mm. to 5.5 mm. Although the smallest increase in the twelve male patients observed occurred in Case 15 (Class II) the Class II group as a whole present a generally greater increment during this period than the Class I group.

In contrast, twelve female patients included in the investigation presented a generally smaller total increment in the Class II group than in the Class I group.

TRANSITION PERIOD FROM DECIDUOUS TO PERMANENT LOWER CANINES

Section 4 of Table VII represents the change in bicanine dimension of twelve male patients during the transition from the loss of the deciduous lower canines to the eruption of the permanent lower canines.

In the Class I column it is shown that two cases lose 1.0 mm. of dimension during this transition, one case gains 1.0 mm., while the other three show no significant change. It is of interest that Case 6, which had no definite spurt and the lowest total increase of the Class I group from "E"–3 years to the loss of $\overline{c \mid c}$, shows the greatest increment of the group during this transition period. Case 9 which had a small increase during spurt and no significant additional increment (0.5 mm.) loses 1 mm. during this period, as does Case 12 which had a near average spurt and no significant additional increment

(0.5 mm.). Case 10 remains the same during this period after an average spurt and no significant additional increment (0.5 mm.). Cases 3 and 7 show no significant change during the transition (0.5 mm.); both had no previous increment except spurt in which Case 7 exceeded Case 3 by 2.5 mm.

The Class II cases during this phase of growth range from a 2.5 mm. loss to a 1.0 mm. gain. Case 14, which presents the 2.5 mm. loss, had an above average spurt and a 1 mm. additional increment. It is of interest to note that this case first manifests a Class II relationship at this stage (the eruption of the lower permanent canines). Case 1 which shows a 0.5 mm. loss during the transition had an average spurt and a 1.5 mm. additional increment, while Case 13, which also shows a 0.5 mm. loss during this period, had the smallest increase during spurt and the largest additional increment. Case 2 remains constant during the transition following an average spurt and a 1.0 mm. additional increment. It is noted that with the exception of Case 6 which showed no definite spurt, both Class I and Class II cases which show the greatest increment in addition to spurt in the period "E"–3 years also show the least increase during the transition period. For example, Cases 13, 1, 14, and 2 of the Class II group gained 1 mm. to 2.5 mm. in addition to spurt in the period "E"–3 years to loss of $\overline{c \mid c}$. These cases lost from 0 to 2.5 mm. during the transition from $\overline{c \mid c}$ to $\overline{3 \mid 3}$. In the Class I group, the two cases which gained 0.5 mm. additional increment lost 0 to 1.0 mm. during the transition. Cases 3 and 7 (Class I) which show no increase in addition to the spurt gain 0.5 mm. during transition, while cases 11 and 15 (Class II) which show 0.5 mm. and no additional increment demonstrate a 0.5 mm. and 1.0 mm. increase during transition.

The increase or decrease in dimension in both Class I and Class II female patients studied seems to bear a relationship to the total increment observed from "E"–3 years to the loss of $\overline{c \mid c}$ rather than the increment in addition to spurt during this period as demonstrated in Class I and Class II male patients. This relationship is more apparent in the Class I group in which those cases presenting the greater total increment also present the greater loss during transition. Those with the least total increment present a gain in dimension during the transition period. This relationship in the Class II female patients is confined to the case presenting the smallest total increment prior to loss of $\overline{c \mid c}$ and the only increase in the Class II group observed during the transition period.

Nine of twelve Class I and Class II female patients studied present a decrease in dimension of 0.5 mm. to 1.5 mm. during the transition period, whereas eleven of twelve male patients studied are distributed quite evenly between increases of 1.0 mm. and decreases of 1.0 mm.

The only marked difference in the amount of variation noted between Class I and Class II male patients during this period is the 2.5 mm. decrease presented by Case 14 (Class II). In contrast, except for Case 22 (Class II) in which the spurt is demonstrated during this transition, the Class II female patients present no significant variation in dimension (all present a 0.5 mm.

TABLE VII. MALE PATIENTS

AMOUNT OF INCREASE TO CLOSEST 5 MM.	SECTION 1 — INCREASE OF DEMENSION DURING SPURT					SECTION 2 — OTHER INCREMENT "E"–3 YEARS TO LOSS OF $\overline{C \mid C}$					SECTION 3 — TOTAL INCREMENT "E"–3 YEARS TO LOSS OF $\overline{C \mid C}$					SECTION 4 — INCREASE OR DECREASE FROM LOSS OF $\overline{C \mid C}$ TO ERUPTION OF $\overline{3 \mid 3}$					SECTION 5 — INCREASE OR DECREASE 2 YEARS FOLLOWING ERUPTION OF $\overline{3 \mid 3}$					SECTION 6 — NET INCREASE FROM "E" – 3 YEARS TO ERUPTION OF $\overline{3 \mid 3}$ + 2 YEARS				
	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II
8.5																												#11	1	1
8.0																														
7.5																														
7.0																										#7	1			1
6.5													#11	1	1															
6.0			#11	1	1																									
5.5	#7	1			1						#7	1	#14	1	2															
5.0													#1	1	1													#1	1	1
4.5			#14	1	1								#2	1	1															
4.0											#10, #12	2	#13	1	3													#2	1	1
3.5	#10	1	#1,#2	2	**3**																					#12	1			1
3.0	#3, #12	2			2						#3, #9	2			2											#6, #10	2	#13, #15	2	4
2.5			#15	1	1	#6	1	#13	1	2	#6	1			1													#14	1	1
2.0	#9	1			1								#15	1	1											#9	1			1
1.5			#13	1	1			#1	1	2														#11	1	1					
1.0								#2, #14	2	1						#6	1	#15	1	2	#12	1			1					
0.5						#9, #10, #12	3	#11	1	4						#3, #7	2	#11	1	3	#9	1	#1	1	2					
0	#6	1			1	#3, #7	2	#15	1	3						#10	1	#2	1	2			#2	1	1					
–0.5																		#1, #13	2	2	#6,	2	#13, #14, #15	3	5					
–1.0																#9, #12	2			2										
–1.5																					#7	1			1					
–2.0																														
–2.5																		#14*	1	1										

*Class II malocclusion first exhibited at this stage.

Class II malocclusion first exhibited at this stage.

TABLE VIII. FEMALE PATIENTS

AMOUNT OF INCREASE TO CLOSEST 5 MM.	SECTION 1 — INCREASE OF DIMENSION DURING SPURT					SECTION 2 — OTHER INCREMENT "E"–3 YEARS TO LOSS OF $\overline{C \mid C}$					SECTION 3 — TOTAL INCREMENT "E"–3 YEARS TO LOSS OF $\overline{C \mid C}$					SECTION 4 — INCREASE OR DECREASE FROM LOSS OF $\overline{C \mid C}$ TO ERUPTION OF $\overline{3 \mid 3}$					SECTION 5 — INCREASE OR DECREASE 2 YEARS FOLLOWING ERUPTION OF $\overline{3 \mid 3}$					SECTION 6 — NET INCREASE FROM "E"–3 YEARS TO ERUPTION OF $\overline{3 \mid 3}$ – 2 YEARS				
	CLASS I CASES		TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II	CLASS I CASES	TOTAL	CLASS II CASES	TOTAL	TOTAL I AND II
6.0																			#22	1	1								#22	1	1
5.5																															
5.0												#18	1			1											#18	1			1
4.5																											#5	1			1
4.0												#16, #23	2	#20	1	3											#17, #25	2	#20	1	3
3.5			#20, #21, #24	3	3									#21, #24	2	2															
3.0	#8, #22	2			2							#8, #17	2			2															
2.5	#16, #17	2			2	#18	1			1																	#16	1	#21, #24	2	3
2.0	#18, #25	2			2							#25	1			1	#5	1		1							#23	1			1
1.5								#4	1	1		#5	1	#4	1	2						#17, #25	2			2	#8	1			1
1.0	#5	1			1	#5, #16, #23	3			3												#5, #18	2			2			#4	1	1
0.5						#17	1	#20	1	2							#25	1		1				#4, #20	2	2					
0			#4, #22	2	2	#8, #25	2	#21, #24	2	4												#16	1	#22	1	2					
–0.5								#22	1	1				#22	1	1	#8, #17, #23	3	#4, #20, #21, #24	4	7			#21, #24	2	2					
–1.0																	#18	1			1	#8	1			1					
–1.5																	#16	1			1	#23	1			1					

decrease). The Class I female patients demonstrate a marked variation, ranging from a decrease of 1.5 mm. to an increase of 2.0 mm. during this transition period.

CHANGES IN MANDIBULAR BICANINE DIMENSION DURING THE TWO YEARS SUBSEQUENT TO THE ERUPTION OF THE LOWER PERMANENT CANINES

Section 5 of Table VII represents the increase or decrease in mandibular bicanine dimension during the two years subsequent to the eruption of the lower permanent canines in the twelve male patients included in the investigation. Here, in contrast to the transition period, the Class I and Class II male patients seem to differ. In the Class I column it may be noted that, generally speaking, the cases which lost in dimension during the transition increase the most in the two subsequent years and those which increase during the transition lose dimension subsequently. These losses and increase do not always match in amount and may represent a tipping of the canines as they settled into adult occlusion referred to by Broadbent[9] as "adjustment of occlusion."

In the Class I group, Cases 6, 7, and 10 show a loss of from 0.5 mm. to 1.5 mm. during the two years subsequent to the eruption of $\overline{3}|3$ while presenting a 0 to 1.0 mm. increase during transition. Conversely, Cases 9 and 12, which decrease 1.0 mm. during transition, increase 0.5 mm. and 1.0 mm., respectively, during the next two years. Case 3 is not included in this section of Table VII as no casts were available subsequent to the eruption of the lower permanent canines.

A study of Section 5, Table VIII, indicates that the Class I female patients fail to confirm this general pattern observed in the Class I male patients. The two Class I female patients who present an increase in dimension during the transition period demonstrate a further increment during the two subsequent years.

In the Class II group, Cases 15, 2, and 1 follow this general pattern; Case 15, which increases 1.0 mm. during transition, loses 0.5 mm. subsequently; Case 2 remains constant both during and after the transition; and Case 1, which decreases 0.5 mm. during transition, increases 0.5 mm. during the two subsequent years. By contrast, the other three cases of the Class II group behave in a very dissimilar manner. Case 11, which increased 0.5 mm. during transition, shows a marked increase of 1.5 mm. in the two subsequent years. Case 14, which decreased 2.5 mm. during transition, shows a further decrease of 0.5 mm. in the following two years. Case 13, which decreases 0.5 mm. during transition, decreases an additional 0.5 mm. in the two subsequent years.

There seems to be no appreciable difference in the amount of variation observed in the Class I male patients as compared with the Class II male patients during this period. In contrast, the Class I female patients present a 3.0 mm. variation (−1.5 mm. to +1.5 mm.) during this period, while the Class II female patients demonstrate no significant change of dimension (−0.5 mm. to +0.5 mm.).

TOTAL INCREASE OF LOWER BICANINE DIMENSION FROM THREE YEARS PRIOR TO THE ERUPTION OF THE PERMANENT LOWER CENTRAL INCISORS TO TWO YEARS SUBSEQUENT TO THE ERUPTION OF THE LOWER PERMANENT CANINES

Section 6 of Table VII summarizes the total increase in lower bicanine dimension during the period from "E"–3 years to two years subsequent to the eruption of $\overline{3|3}$. Four of five Class I male patients present increases during this period of 2.0 mm. to 3.5 mm. (the remaining case, No. 7, presents a total increase of 7.0). In comparing this to the original spurt in Section 1 of Table VIII, it is noted that the same number of cases was included in the same range of increase; however, in comparing the case numbers, it becomes evident that, except for Case 9, the same cases are not represented in the two sections. To elaborate: Case 10 has a spurt of 3.5 mm. and a total increment (Section 5) of 3.0 mm.; Case 12 has a spurt of 3.0 mm. and a total increment of 3.5 mm.; Case 6 has no spurt and a total increment of 3.0 mm.; Case 9 has a spurt and a total increment of 2.0 mm. It is interesting to note, however, that in the cases which show a spurt of 2.0 mm. to 3.5 mm., there is little change in the total increase (i.e., the amount of spurt is nearly equal to the total increment at two years after to the eruption of $\overline{3|3}$), while Case 7 which had a spurt of 5.5 mm. continues to increase to a total of 7.0 mm. demonstrated by the Class I male patients studied.

This correlation as noted in Class I male patients fails to be reflected in the Class I female patients studied. Although six of seven Class I female patients present a spurt ranging from 2.0 mm. to 3.0 mm., only three of the six demonstrate a comparable total increment (1.5 mm. to 2.5 mm.) during the period included in this study. The remaining four present a total increment of 4.0 mm. to 5.0 mm.

In the Class II male patients, Case 15 with a spurt of 2.5 mm. presents a total increment of 3.0 mm., and Case 2 with a spurt of 3.5 mm. shows a total increment of 4.0 mm. Case 1, however, which also has a spurt of 3.5 mm., demonstrates a total increment of 5.0 mm. which does not follow the pattern described by the Class I male patients as do the preceding two cases. Case 11 with the largest spurt of 6.0 mm. shows a subsequent gain of 2.5 mm., 1.5 mm. of which occurs after the eruption of $\overline{3|3}$. By contrast, Case 14, with a spurt of 4.5 mm., presents a total increment at two years after the eruption of $\overline{3|3}$ of only 2.5 mm., or 2.0 mm. less than the increment during spurt. (The lower bicanine dimension in Case 14 just described at 13 years, 9 months of age is equal to this dimension at 6 years, 9 months.) Case 13 which has a growth spurt of 1.5 mm. has a total increment of 3.0 mm.

Four of six Class II male patients present a total increment through two years subsequent to the eruption of $\overline{3|3}$ of 2.5 to 5.0 mm., while three of five Class I male patients have a total increment of 3.0 to 3.5.

The Class I female patients studied also fail to demonstrate any relationship between increased dimension during the spurt and total increment.

During the period included in this investigation, a greater number of Class II male patients observed present a greater amount of variation in total increment than is demonstrated by the Class I male patients studied.

A correspondingly greater variation in increment is noted in Class II female patients than in the Class I female patients included in the study.

SUMMARY AND CONCLUSIONS

The changes in mandibular bicanine dimension were studied in the casts of 24 children followed through the period from three years prior to the eruption of the lower permanent central incisors to two years subsequent to the eruption of the permanent canines. The wide range of variability in these individuals tends to confirm the observations of many previous investigators.

The greatest increase in this dimension during this interval occurs during a period of accelerated increase. Although this spurt, in a study of averages, occurs between the ages of 5 and 8 years, a wide individual variation in time of spurt is observed.

This variability in time of spurt is also noted, although to a lesser degree when considered in relation to the eruption of the lower permanent central incisors rather than to chronological age.

There is a wide variability in the time of beginning, of completion, and of duration of the spurt in both Class I and Class II (Angle) male and female patients studied. However, in this small series the variability appears to be greater in the Class II cases, both male and female, than observed in the Class I groups. Moreover, the Class II male and female patients included in the investigation demonstrate a wider variation than do the Class I male and female patients, both in the amount of increase during spurt and in the total increment from three years prior to the eruption of $\overline{1|1}$ to the loss of $\overline{c|c}$.

Although male and female patients with Class II occlusion show a generally greater increase in this dimension during the spurt than those of the Class I group, yet both male and female patients demonstrating the smallest increase during the spurt also present Class II occlusions.

Nine of twelve Class I and Class II female patients included in the investigation present a decrease in the mandibular bicanine dimension during the period of transition from deciduous to permanent canines, while eleven of twelve male patients vary between increases of 1.0 mm. and decreases of 1.0 mm.

During this transition period, there seems to be no marked difference in the amount of variation between Class I and Class II male patients except a marked decrease in one Class II case studied. The female patients, however, show greater individual variation in the Class I group.

During the two years subsequent to the eruption of the lower permanent canines, there is a variation in six Class I male patients studied, ranging from a decrease of 1.5 mm. to an increase of 1.0 mm.; in the six Class II male patients the variation ranges from a decrease of 0.5 mm. to an increase of 1.5 mm. The Class I female patients, by contrast, present a wider variation of a

1.5 mm. decrease to a 1.5 mm. increase, compared to the Class II female patients who present no significant change (0.5 mm. decrease to 0.5 mm. increase).

There seems to be no appreciable difference in the amount of variation observed in the Class I male patients as compared with the Class II male patients during this period. However, the Class I female patients present a markedly wider range of variability than do the Class II female patients observed.

There is apparently no correlation between the amount of increase in mandibular bicanine dimension during the spurt and the total increment during the period included in this investigation. However, a greater number of Class II male and female patients observed present a wider variation in total increment than is demonstrated by the Class I male and female patients studied.

Obviously, broad generalizations cannot be based upon the investigation of so small a number of individuals. However, in view of the marked individual variations observed in this study, it seems permissible to conclude: (1) that no general rule concerning timing, duration, or amount of increase in mandibular bicanine dimension may safely be applied to a given individual; (2) that future increases or decreases in this dimension are not easily predictable in attempting to evaluate an orthodontic problem for such an individual in this age range.

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523 REPUBLIC BLDG.

PROTECTION OF ENAMEL UNDER ORTHODONTIC BANDS

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INTRODUCTION

CONSIDERING the fact that cementation of bands is the technical procedure done most often in an orthodontist's office, very little has been written about the subject. No matter what philosophy is followed, it is necessary to cement bands. The only difference is in the number of teeth involved and the method of mixing cements. The problem of decalcification has stared the orthodontist in the face since orthodontics has been practiced. This decalcification, commonly called etching, has been blamed on many factors, among which are: loose-fitting bands, poorly mixed cement, food and debris taking the place of washed-out cement, too infrequent removal of bands and the reverse, too often removal of bands, desiccated enamel by too much drying, either with air or alcohol, or not enough drying and too much saliva mixed with the cement, and the type of material used in the appliances.

But, as Bodecker[1] asks, why are not all banded teeth etched? Why are some teeth more susceptible than others? In his paper showing the evidence of the harmful effects of cement under bands Lefkowitz[2] suggests in his conclusions that perhaps a coating of some type on the teeth before placement of bands might be of some help. Castello and associates[3] make reference to a similar suggestion.

With this in mind, a study was set up whereby a "protective coating" was placed on the teeth which were to be banded. The mechanism of this study will be explained in detail under another heading.

HISTORY AND REVIEW OF LITERATURE

Not many pertinent references were found in the literature. Lefkowitz[2] gives evidence that dental cement decalcifies enamel. He showed that unknown factors allow the acid to penetrate only certain of the areas exposed to cement, resulting in what he called islands of decalcified zones. The reason for this variable susceptibility is unknown. He demonstrated that carious enamel resists the free phosphoric acid of dental cement more than normal enamel. This was corroborated by Enright, Friesell, and Trescher.[4] Using a protective varnish on anterior teeth, his preliminary observations indicated that the method was effective, and he advocated its use before placing orthodontic bands. The cement was not dissolved from under the bands in his experiments, so therefore the decalcification could not be blamed on the decomposition of food. The etching produced by the cement is not a true carious

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood it does not necessarily represent nor express the opinion of the Board.

lesion, he stated, but there can be no doubt that such areas can be attacked more readily than normal enamel because they are areas of lower resistance to caries.

McClelland[5] shows that enamel can be decalcified at a pH as high as pH 4.5 within twelve hours, and that any solution having a hydrogen-ion concentration of pH 6.0 and below will decalcify at a rate of speed in proportion to the degree of acidity.

Etching of enamel has been produced experimentally through the action of weak acids, lactic acid being the most common. Mummery[6] and Bunting and Palmerlee[7] reported that enamel was unevenly decalcified by acid. Enright, Friesell, and Trescher[4] showed these reports to be true. They demonstrated that etchings occurred with relatively weak acids, and that certain isolated areas were more susceptible than others.

Noyes[8] shows that there is a similarity between etched enamel and the early stages of carious enamel, and states that decalcification is a precarious lesion. He says that the etching is due to ill-fitting bands or where cement has washed out.

Some researchers are of the opinion that an unknown element of resistance to caries and decalcification does exist.[9, 10] Many orthodontists have experienced this clinically, and therefore never dehydrate a tooth before placing a band.[11] The majority of orthodontists completely dry the tooth before cementation. Some even dehydrate the surface with alcohol.

Castello and associates[3] had a series of thirty-six recently extracted teeth, and they demonstrated that all enamel surfaces exposed to the action of various mixes of cement were more or less affected, and because the etching was more prominent on the ground surfaces than on the unground surfaces they indicated that this meant the presence of a "protective film" on the surface of the intact tooth. This is the same protective film that others have indicated.[2, 9, 10] The etching they showed was spotty and circumscribed, indicative of a partial adherence of cement to enamel. In their experiments, as in Lefkowitz's,[2] the cement mixes did not affect the enamel surfaces covered by a protective varnish.

Chase[12] reviews the theories concerning the nature of the "protective film," and many other investigators have talked about and described this protection against tooth decay. All agree that when the tooth surface is treated with dilute acids a definite membrane-like structure can be separated from the crown, and have shown it to be acid-resistant.[13]

Grieves[14] pointed out that careful and regular cleansing of the tooth surfaces in children undergoing orthodontic treatment made these surfaces about the appliances more liable to decalcification. He indicated the loss of something, "probably that a protective process had been interfered with."

In a discussion about the production of chemicoabrasion, Box[15] states that one of the factors involved is the removal of a protective substance from the tooth surface.

Lefkowitz and Bodecker,[16] in an earlier experiment, showed that dyes penetrated the enamel of dogs only in those areas which were subject to the action of oxyphosphate cement. It seemed evident that the action of the cement made the enamel abnormally permeable from without, so that the dye could penetrate the enamel and, in certain areas, also the dentine. The normal impermeable surface of the enamel is considered a barrier to dental caries, and this property should be maintained.

In a recently published article on etching of enamel under orthodontic bands, Gross[17] blames all decalcification on the type of cement mix. He claims that cement can be prepared in such a way as to insure the enamel against etching. He states that the evidence presented in previous papers was of questionable value. In his experiment on twenty teeth about to be extracted he took the necessary precautions, so that his mixes were completed in approximately two and one-half minutes. He claims that this slow mix, incorporating small amounts of powder at a time, used up most of the free phosphoric acid, and therefore no etching took place. In an editorial, appearing the same month in the same journal, Bodecker[1] challenges this article.

COMPOSITION OF DENTAL CEMENT

In all dental cements the liquid is principally phosphoric acid, and all cements are basically alike. The liquid, mostly phosphoric acid, has a small amount of zinc and aluminum phosphate added. Zinc oxide is the main part of the powder, with a small percentage of magnesium oxide.

Paffenbarger and associates[18] found that the liquid of oxyphosphate cement contains about 50 per cent free phosphoric acid, and has a pH of about 2.0. By incorporating small quantities of powder into the liquid and mixing slowly, the liquid gradually approaches the neutralization point, and therefore there will be a smaller amount of free acid. The acid is not neutralized for about twenty-four hours after mixing, at which time the pH of the set cement is approximately 7.0. Crowell[19] showed that zinc phosphate cements reach an acidity of about pH 6.5 in approximately one week.

OBJECT OF STUDY

This investigation was carried out because it is obvious that dental cements are a factor in the decalcification of teeth under orthodontic bands, and because, as many researchers have claimed, there seems to be a "protective film" on the surfaces of teeth. By coating teeth with a varnish on one side of the mouth and leaving the other side alone before bands were cemented, records were kept to see if this varnish protected teeth from decalcification. Both Lefkowitz[2] and Castello and associates[3] suggested using a varnish of some type, because the few teeth on which they used collodion seemed to be protected from etching. It was known before undertaking this study that the more slowly cement was mixed, the less free phosphoric acid was allowed to contact the tooth, but it seemed that the slow controlled mix was not the answer to the whole problem.

METHOD OF PROCEDURE

A number of different tissue varnishes and cavity linings were experimented with, and finally one particular cavity lining was selected because of its ease of manipulation.* The difficulty with collodion was the same as with a number of other varnishes. It took a little too long to dry to be of practical value for use in the practitioner's office. The film decided upon dried in a matter of just a few seconds, and was not objectionable esthetically. It is a Copal resin with a small amount of chlorobutanol. The experiment was carried on both in the office and at the Forsyth Dental Infirmary. All types of appliances were used, including the Johnson twin wire, edgewise, and labiolingual. Because it was easier to reach the anterior teeth, in many mouths only the central and lateral incisors were used in the experiment. The teeth to be banded were divided into two groups. One group, on the right side, had the varnish applied before cementing bands. The other group, on the left side, had no varnish applied and the bands were cemented in the usual manner. Chart I shows the instruction sheet for cementing bands in this experiment. The cement was mixed according to the method advocated by Gross.[17]

CHART I. INSTRUCTION SHEET FOR DECALCIFICATION STUDY

Divide teeth to be banded into two groups:

I. Copalite—Right Side
1. Clean teeth to be banded with pumice.
2. Dry excess moisture with air.
3. Apply Copalite with pledget of cotton.
4. Allow to dry approximately thirty seconds.
5. Cement bands.

II. No Copalite—Left Side
1. Clean teeth to be banded with pumice.
2. Dry excess moisture with air.
3. Cement bands.

Record all decalcifications on master chart before cementing bands.

All bands should be removed at approximately six months, the teeth dried thoroughly, and any additional etchings recorded on the master chart before recementation.

Five hundred forty-eight teeth were used in this study, divided into 397 upper teeth and 151 lower teeth. Two hundred seventy-five of these teeth were on the right side, and were protected with the varnish. Two hundred sixty-three teeth were on the left side, and had no varnish protection.

No attempt was made at microscopic examination, because all the teeth were clinically sound, and none would be extracted for orthodontic reasons. The enamel surfaces were examined by direct observation. The teeth were dried first, and all marks of any type, etchings or precarious lesions, were charted. At approximately six months the bands were removed, the teeth cleaned and dried, and any new decalcifications were recorded.

RESULTS

Of the 548 teeth used in this study, clinically 79 were found to have new areas of decalcification. On the right side of the mouth, the protected side, 275 teeth were coated, and 15 upper and 1 lower tooth were affected. On the unprotected side, the left, 265 teeth were tested, and 57 upper and 6 lower teeth had new marks.

*Copalite.

In the breakdown of the right, protected side, Table I, of the 83 upper central incisors, 6 new etchings were seen. Of the 83 upper lateral incisors there were 7 new marks, and only 1 first molar out of 13 had a new decalcification. Only 1 new mark was visible on the lower right side, and strangely it was one of the 2 tested first premolars.

TABLE I. RIGHT SIDE OF MOUTH SHOWING NUMBER OF TEETH COATED WITH COPALITE AND NUMBER OF NEW MARKS

	UPPER		LOWER	
TOOTH	NUMBER OF TEETH	NUMBER OF TEETH WITH NEW MARKS	NUMBER OF TEETH	NUMBER OF TEETH WITH NEW MARKS
Central incisor	83	6	28	0
Lateral incisor	83	7	28	0
Cuspid	13	1	2	0
First premolar	1	0	2	1
Second premolar	6	0	3	0
First molar	13	1	12	0
Second molar	1	0	0	0

On the left side, Table II, 16 out of the 80 tested upper central incisors showed a new mark of some type, and 34 of the 76 upper lateral incisors had some degree of etching. One of 12 tested upper cuspids and 5 of 13 upper first molars were decalcified. The only upper second molar tested showed a new etching. New decalcification was seen on 1 of the 2 lower cuspids and on 5 of the 11 lower first molars. Records were kept on only 8 deciduous teeth, 4 upper right incisors and 4 upper left incisors, and none of these showed any new marks when the bands were removed.

TABLE II. LEFT SIDE OF MOUTH SHOWING NUMBER OF TEETH BANDED WITHOUT COPALITE AND NUMBER OF NEW MARKS

	UPPER		LOWER	
TOOTH	NUMBER OF TEETH	NUMBER OF TEETH WITH NEW MARKS	NUMBER OF TEETH	NUMBER OF TEETH WITH NEW MARKS
Central incisor	80	16	28	0
Lateral incisor	76	34	29	0
Cuspid	12	1	2	1
First premolar	1	0	0	0
Second premolar	6	0	3	0
First molar	13	5	11	5
Second molar	1	1	1	0

New decalcified marks were recorded as to whether they were found on the vestibular or the lingual surface. Thirty-four new etchings were found on the vestibular surfaces, and 45 of the 79 markings were on the lingual.

On the right side:

Upper right central incisor, 4 vestibular and 2 lingual.
Upper right lateral incisors, 2 vestibular and 5 lingual.
Upper right cuspid, 1 vestibular.
Upper right first molar, 1 lingual.

TABLE III. RIGHT SIDE OF MOUTH (COATED) SHOWING WHERE NEW MARKS WERE FOUND

	UPPER			LOWER		
TOOTH	NUMBER OF TEETH WITH NEW MARKS	VESTIBULAR	LINGUAL	NUMBER OF TEETH WITH NEW MARKS	VESTIBULAR	LINGUAL
Central incisor	6	4	2	0	0	0
Lateral incisor	7	2	5	0	0	0
Cuspid	1	1	0	0	0	0
First premolar	0	0	0	1	1	0
Second premolar	0	0	0	0	0	0
First molar	1	0	1	0	0	0
Second molar	0	0	0	0	0	0

The only lower new mark on the right side on the one first premolar was found on the vestibular (Table III).

On the left side:

Upper left central incisor, 7 vestibular and 9 lingual.

Upper left lateral incisor, 10 vestibular and 24 lingual.

Upper left cuspid, 1 vestibular.

Upper left first molar, 2 vestibular and 3 lingual.

Upper left second molar, 1 lingual.

Lower left cuspid, 1 vestibular.

Lower left first molar, 5 vestibular (Table IV).

TABLE IV. LEFT SIDE OF MOUTH (UNCOATED) SHOWING WHERE NEW MARKS WERE FOUND

	UPPER			LOWER		
TOOTH	NUMBER OF TEETH WITH NEW MARKS	VESTIBULAR	LINGUAL	NUMBER OF TEETH WITH NEW MARKS	VESTIBULAR	LINGUAL
Central incisor	16	7	9	0	0	0
Lateral incisor	34	10	24	0	0	0
Cuspid	1	1	0	1	1	0
First premolar	0	0	0	0	0	0
Second premolar	0	0	0	0	0	0
First molar	5	2	3	5	5	0
Second molar	1	0	1	0	0	0

DISCUSSION

Lefkowitz[2] and Castello and associates[3] have tried a coating on teeth before cementation. Both used collodion and found that this did give protection against etching, and this was offered as a method for protecting the enamel surfaces of teeth. The cement adhered just as firmly against the coated surfaces. With this in mind, a number of different cavity linings and varnishes and collodion were tried in this study. Collodion, and most of the others, took too long to dry to be practical, and, because they peeled, were difficult to use.

There are probably four principal reasons why the cavity lining finally decided upon might aid in protecting the enamel surfaces:

1. Lowers surface tension.
2. Seals off any open lamellae of the tooth.
3. Might form a more permanent bond between enamel, band, and oxyphosphate cement.
4. Has a pH of 6.5.

It was realized that a slow mix with the liquid incorporating as much powder as possible has less free phosphoric acid. For this reason the method advocated by Gross[17] was followed as closely as was practical.

It must be kept in mind that a great number of the etched areas discovered in this study were mild and hardly noticeable, unless the teeth were dried and examined closely. On a moist surface it is usually difficult to see the decalcification unless a large area is involved.

Etching of the enamel as a result of orthodontic treatment is often one of the results of wearing bands cemented to the teeth. This has been a discouraging problem, and it is especially disappointing when decalcification occurs on the anterior teeth.

Probably all orthodontists have noticed that areas of decalcification or etching, which are usually white or whitish, are sometimes present when bands are removed. If the tooth is dried thoroughly, quite often these areas show up, even when they are not noticed on the wet or moist surface.

In the few articles written on the harmful effects of cement under orthodontic bands, it was reported that dental cements decalcified enamel after the bands were on for only a few days, and examining the surfaces microscopically after the teeth were extracted confirmed this. These papers were reviewed in a previous section. Only Gross[17] completely blamed the etching on the type of cement mix.

The theory was advanced that all enamel surfaces have weak areas, and that the free phosphoric acid of the cement harms these areas and causes decalcification. For this reason perhaps bands should be recemented only at infrequent intervals, unless the surfaces of the enamel are protected by some type of coating.

As Noyes[8] pointed out, cement washing out under bands and the subsequent collection of debris against the enamel will cause etching. This etching is more involved than that caused by the phosphoric acid; quite often it is soft and caseous, even causing a cavity through the enamel. If the free phosphoric acid starts the original decalcification, and then cement washes out with food particles jamming under the band, quite serious damage may result.

As previously pointed out, several investigators have indicated the presence of a "protective film" on the surfaces of teeth. For this reason the teeth were not dried thoroughly before cementation in this study.

The fact that 34 of the 76 upper left lateral incisors had some degree of new etching, and the fact that 24 of the 34 marks were found on the lingual surface, seems to point out that more care should be taken with the upper lateral incisors. These teeth often have poorly formed grooves on the lingual

surfaces, and it is common to find a catch with an explorer just above the cingulum. Whatever the reason, in this study this tooth was the most commonly affected.

On the unprotected lower first molar, etching was seen most often on the vestibular along the gingival surface. The upper first molar seemed to be relatively immune to new decalcification.

One hundred thirteen lower central and lateral incisors were examined before and after cementing bands, and none of these teeth had any new etching. This might indicate that, for some reason, these teeth are immune to decalcification by phosphoric acid, and this thought might be the basis of an investigation.

Percentagewise, approximately 27.4 per cent of the uncoated teeth showed new areas of decalcification when the bands were removed. Of the protected teeth, those that had a coating of the cavity lining before cementation, 5.9 per cent showed new etchings after the bands were removed.

SUMMARY AND CONCLUSIONS

An attempt was made in this study to see if a varnish coating, painted on the enamel of teeth before cementation of bands, would protect the surface against decalcification.

Five hundred forty-eight teeth were charted before cementing bands, and the 275 which were on the right side of the mouth were coated with a cavity lining.* The 263 teeth on the left side were not treated before the bands were placed. Bands were removed at approximately six months, and any new etchings were charted.

Twenty-seven and four-tenths per cent of the uncoated teeth showed new areas of decalcification. Five and nine-tenths per cent of the teeth with the protective coating had new etchings.

The upper lateral incisor, on the lingual surface, was the tooth which showed the greatest percentage of new etching.

The lower central and lateral incisors seemed to be immune to new decalcification, both on the coated and uncoated surfaces.

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Editorial

Bands on Teeth

IN THE May issue of the JOURNAL there appeared a reprint of an editorial on the subject of enamel etching with orthodontic bands. This editorial appeared originally in the *New York Journal of Dentistry* and was written by Dr. Charles F. Bodecker, the editor of that journal. Since the Bodecker editorial appeared, considerable comment has been both written and spoken on the subject of orthodontic bands being responsible for various discolorations, etchings, and other defects.

An informal inquiry among various orthodontists of wide clinical experience points up the fact that the "voice of experience" seems to leave little doubt that the principal cause of these defects, disintegration of cement under the band, seems to be overlooked by those who are casting about for some facts to be assembled.

If you have practiced orthodontics as a specialty for over five years, you have learned that a band over a tooth without cement under it very soon reveals a blanching of the tooth, and a softening of the enamel. This obviously needs no scientific explanation other than what is everyday knowledge—that decomposition occurs as a by-product of putrefaction.

The most common line of demarcation left on a tooth with a cemented band is a line outlining the edge of the band. This is obviously due to the disintegration of a cement line exposed directly to the saliva. Cement a band on a tooth and allow only a small portion of the band to be sealed with cement, and it is hazardous to the tooth structure during treatment.

Many orthodontists say there is very little etching or discoloration of teeth that are covered with orthodontic bands if meticulous care is observed in removing bands from time to time and care is taken in cementing them.

Nine times out of ten, where you find etching or discoloration, you will find the band is uncemented at some spot where it is in contact with the tooth. Another common spot for discoloration of tooth structure as a result of orthodontic bands is the buccal surface of the lower first molar.

That all bands on teeth undergoing orthodontic treatment should be removed and reset with new cement from time to time seems to be well agreed.

It is obvious, however, to those of wide orthodontic experience that once orthodontic bands have been placed on teeth, and one or more teeth suffer from dental caries at any time during the lifetime of the patient, the orthodontic bands will be blamed. The statute of limitations never expires on blaming orthodontic bands for the decay of teeth. That is one reason orthodontists "lean backwards" to check and double check during treatment.

H.C.P.

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The Temporomandibular Joint: Edited by Bernard G. Sarnat, Professor and Head of the Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Illinois. Springfield, 1951, Charles C Thomas.

This text is another monograph in the "American Lecture Series." It is a short anthology of some recent lectures by five contributing authors, and the net result is quite commendable.

The average dental practitioner or student reading this handy volume for information, and as an explanation to his clinical problems, is overwhelmed by the extensive and detailed anatomical presentation that may bog him down. However, if he will take the trouble to study and understand it, the clarity of the collaborators' presentation will compensate him.

The avowed purpose of this monograph is "not intended as a complete review and a summary of the subject, but rather as a basis for critical evaluation of the literature." But some of the presentation is original and not necessarily a review, and should serve the more authoritative purpose than a plea for re-evaluation of the literature.

Dr. Sarnat shows good judgment in editing a tome of this kind. It is to be regretted that he did not include a chapter on the surgical approach to the problem. Since this procedure is common practice in Europe, and particularly in Norway, namely, excising discs in temporomandibular disorders, it would be pertinent and help round out a careful presentation. This procedure is receiving mounting attention in the United States, not only among maxillofacial surgeons, but also orthopedic surgeons, and a true report on the necessity, validity, and value of menisectomies would be of great value; his position and acuteness qualify him to be heard.

The first chapter on the Functional Anatomy of the Temporomandibular Joint, by Harry Sicher, is a marvel of detail and fastidious observation. In fact, more than two-thirds of the forepart of the book is concerned with functional anatomy, growth and pathology of the joint, and it impresses one with greater accuracy than the last third, because it is mostly factual, and only a little conjectural or controversial. However, when Dr. Sicher claims the pure hinge movement of the joint is a strained one, something your reviewer has long contended, it is hard to rationalize the assignment of the movement from centric to rest position as a pure hinge movement. But these minor differences are dissipated when one reads the precise and illuminating clarity of presentaiton of other portions like the synovial chambers.

While the chapter that follows on the Histophysiology of the Joint, in which Dr. Joseph P. Weinmann joins with Dr. Sicher, is a short one, it is beautifully written and forms an important basis for understanding the full thesis of the book. In fact, it is an interesting commentary that it is necessary intimately to understand the minute structures of the joint if we are to have a full understanding of its function and pathological sequences in insulting abuse.

Brodie's classical earlier work of the role of the condyle in maintaining the vertical dimension in facial growth, and the importance of the condyle as the "moderator" for all directional growth of the face, is still interesting reading when viewed as an ordinate of the whole picture.

Bauer's comprehensive and detailed description of the pathology of the joint in degenerative bone disease in arthritis, written in 1932, still stands as the accepted work and forms an important part of the second chapter that Weinmann and Sicher collaborate on in the Pathology of the Joint. They support the now generally accepted statement that the articular disc is found perforate and sometimes destroyed. The conception that it is rarely violated is abandoned. This chapter is a gem and should prove a constant reference source to students and practitioners concerned with abnormal reactions of this contentious and challenging anatomical structure.

The denial of the possibility of a retrusion of the condyle head back up into the depths of the fundus of the fossa, as is claimed, is being daily contradicted roentgenographically. It occurs not only through abrasive wear or mutilation of occlusion over a long period of time, but even in the comparatively short interval of a week, when grinding of the posterior teeth was employed to reduce an anterior open-bite.

In his efforts to disprove Costen's contentions of the syndrome bearing his name, Dr. Arnold A. Zimmerman, Professor of Anatomy in the Colleges of Medicine and Dentistry at the University of Illinois, categorically rejects practically all of them with the exception of pain symptoms referred to the vertex of the head and the occiput. He is very convincing and his arguments are appealing. It is a comfort to know that this competent anatomist finds with the reviewer that perforations of the disc occur in the lateral portions.

His appeal for a re-evaluation of Costen's syndrome in the light of the newer anatomic studies and functional interpretations of the joint emphasizes our changing concept to it. His explanation of the importance of the free movement of fascial planes as gliding surfaces between muscles is a practical point, little appreciated by those subscribing to Costen's thesis of relaxed ligaments and musculature. It is nonexistant in this state in the preserved cadaver.

While there is a remarkable general agreement of the different contributing authors in their anatomical and physiological presentations, there are a few conflicts in concepts and therapies that may be a bit confusing.

There are some inconsistencies and unfounded statements in the concluding chapter on Diagnosis and Dental Treatment by John R. Thompson. He labors the point that the closing movement of the mandible is *almost* a hinge axis, when he acknowledges that there may be bodily movement of the condyle, but that this movement "may actually still be a hinge movement if the axis is slightly below the center of the condyle." It can hardly be a hinge if it is accompanied by translatory body movements. It *is* what is generally known as "a gliding hinge combination movement." Sicher on page 29 says that a hinge movement is a strained one.

The explanation of the initial movements of the opening process does not seem convincing, especially in the light of contradictory visual evidence of cinefluoroscopy or animated serial studies.

The method of appraisal of abnormal condylar relations cephalometric roentgenograms in lateral projection reveals one critical omission. It records abnormalities in only the anteroposterior relation of the condyle in the fossa. There is no record of any mediolateral displacement. Since the anatomy of the mandibular fossa invites displacements in its wider physical accommodation, this view should also be included in a complete diagnosis through a properly projected stereoscopic roentgenogram taken in the anteroposterior projection.

To your reviewer this anthology was a delight and a mine of useful information. To the earnest clinician and student it will prove rewarding and profitable. It was both of these to me.

Sidney E. Riesner.

Growth of Bones: Methods of Assessing and Clinical Importance. By Bernard G. Sarnat, M.D., D.D.S., and Benjamin J. Gans, D.D.S., M.S. (This is part of the complete article which was published in *Plastic & Reconstructive Surg.* **9**: 140-159, February, 1952.)

"Any interference which will affect the growth centers of bones will alter the orderly progression of development and will result in some type of deformity. . . . The purpose of this report is to review and to evaluate the significant clinical and experimental methods for assessing growth of both facial and long bones. . . .

"Anthropometry of the dried specimen brings with it the disadvantages of the static cross-sectional type of study. . . . Posthumous distortions add to the inaccuracy of this static method. . . .

"Implants have been used in the study of growth of bones for more than 200 years. Humphry, by placing wire loops around the ramus of the pig mandible, demonstrated that there was resorption on the anterior border and deposition of bone on the posterior border of the ramus. Hunter inserted two pellets along the length of the shaft of the tibia of a young pig and measured the distance between the pellets. When the tibia was fully grown, it was found that the distance between the pellets had remained exactly the same. This experiment proved that there was no interstitial growth of bone. Implantation of screws, pegs or wires on each side of the growth centers of long bones, however, can be utilized for the study of total amount of bone growth by measuring the increase in distance between the implants. Under special conditions (i.e., when combined with roentgenography) it may also reveal the site, rate and relative direction of growth.

"Gans and Sarnat studied sutural facial growth of the monkey by combining the techniques of implantation of amalgam with serial cephalometric roentgenography. The methods employed were as follows: Small holes were prepared on each side of the accessible facial sutures. Amalgam was then implanted into these openings and the distance between the paired implants recorded. Roentgenograms were taken at monthly intervals and composite tracings made. Upon sacrificing the animals, measurements were again taken on the skulls.

"Information about the direction of growth of a bone or group of bones, as in the face, can also be derived from serial roentgenography. Tracings of the roentgenograms at different stages of development are superposed on the same anatomical landmark and the change in position of structures noted. Selection of a stable anatomic base is the key to reliable findings since any shift of the area used as a base line distorts the true direction of growth.

". . . Hunter (1771) perfected the experimental method of feeding madder and thus was able to give us his classical report of the growth of the mandible in the pig. He also demonstrated the wide alternate layers of red and white (corresponding to the prolonged periods when madder was fed and withheld) in longitudinal and transverse sections of long bones. Brash repeated Hunter's work and came to similar conclusions. . . .

"In contrast to the method of prolonged madder feeding with diffuse effects, the sharp vital staining of calcifying bones may be obtained by a single

intra-peritoneal or intravenous injection of a 2 per cent solution of alizarine red S[3]. Alizarine is one of the principal tinctorial agents found in madder and is available in synthetic form.

"There are three ways in which growth of a bone may occur, namely: (1) on its surfaces, (2) by replacement of growing cartilage (epiphyseal, articular, etc.), and (3) at sutures. Alizarine red S is found in these areas and is believed to indicate an increase in size. Alizarine is also found in the trabecular framework where adjustments are made to meet the changing situation.

". . . The problems involved in bone formation are at least threefold: (1) the origin and transformation of the bone cells from the undifferentiated mesenchyme; (2) the formation and composition of the matrix substances; and (3) the mode of deposition of the bone salts in the matrix.

"Although growth of bones is greatest in the young, nevertheless bone tissue is in a state of continuous change throughout life as a result of an interplay of formation and destruction. In areas where bone is being apposed osteoblasts are found arranged in a continuous single layer like cuboidal epithelium upon the surface of the bone. Osteoclasts are found in areas where bone is being destroyed or resorbed. The osteoclasts are multinucleated giant cells of varying size and shape and are found in shallow hollows (Howship's lacunae) on the surface of the bone trabeculae. The processes of bone formation and destruction as well as the role of the osteoclasts and osteoblasts are at best incompletely understood at this time.

"Plaster casts were used extensively and proved to be extremely valuable clinically in determining the normal and abnormal growth and development of the dental arches. The orthodontist requires serial dental casts for the analysis of a malocclusion and the progress made with treatment. In a similar manner the surgeon can obtain important information in regard to the progress of his patient with a cleft palate.

". . . Photographs taken under controlled conditions with the subjects placed against a graduated grid have permitted their classification from a morphologic point of view. Sheldon, Stevens and Tucker used such grids for establishing somatotypes. Although this method does not lend itself to accurate measurements of growth of individual bones, it does permit the study of growth of the entire subject.

"Roentgenography is a reliable indirect method of studying growth of bones. In 1912 Tandler suggested the use of x-rays in the anthropometry of the skull. In 1931 Broadbent and Hofrath simultaneously but independently described a technique of cephalometric roentgenography. In 1937 Broadbent reported his findings gained from cross-sectional studies of large groups of growing children. Brodie in 1941 was the first to apply Broadbent's method to a longitudinal growth study of human males from the third month to the eighth year of life.

"The accuracy of this method depends on standardization of technique. The film target distance is constant. The subject is repositioned at given time intervals to the Broadbent-Bolton cephalometer instead of adjusting the machine to the subject. By superpositioning tracings of serially taken roentgenograms the relative positions of various portions of the skull are recorded on a composite tracings and measurements taken therefrom.

"This method eliminates the most serious deficiencies of the anthropologic technique. It permits a dynamic study of the growing child, i.e., the increase in size and the change in proportion of the same growing bone or group of bones forming a bone complex as in the middle third of the face. It reveals the rate, the amount and relative direction of bone growth. It does not, however, reveal the sites or the mode of growth of bones.

"Under certain conditions skeletal roentgenograms are of value to determine sites, amounts and rates of long bone growth. Increase in total length or width of a bone can be readily determined from the x-ray picture by use of the proper correction factor.

"In contrast to total growth (in length) of a bone, the sites and relative rates of growth can be determined from metaphyseal bands of increased density in the roentgenograms of growing long bones. These bands are nonspecific as to cause. They have been produced by yellow phosphorus, lead, bismuth and thorium X and may affect the rate of long bone growth.

"Similar lines can result from arrest of growth at the time of acute illnesses. It is probable that all types of metaphyseal bands and lines of increased density resulting from various factors are produced in the same manner, i.e., by diminution of the resorption of cartilage matrix and bone.

"Thus by a combination of the above methods excellent in vivo roentgenographic markers are obtained to visualize the site and relative rate and amount of epiphyseal growth. Information obtained about a single bone can be compared with the other bones. In growing animals the band can be seen by the end of the second week. Inasmuch as these bands are found at the site of epiphyseal growth, it is not surprising that they are also found at the sutures at the base of the skull (basispheno-occipital and basispheno-presphenoid) where cartilage is also replaced by bone.

"A radioautograph is obtained by placing the tissues of an animal given radioactive material in close contact with a photographic emulsion for a suitable exposure period. Alpha or beta rays from the radioactive material affect the silver bromide crystals of a photographic emulsion in a manner similar to that of light. After development and fixation of the film, darkened areas will be found which correspond to the distribution of the radioactive material. Application of this principle was reported as early as 1904.

"Radioisotopes have already yielded considerable fundamental information previously unobtainable on the growth and development of animals. It is important to point out that a radioactive isotope of an element will behave in exactly the same manner biologically and chemically as the stable isotopes of the same element so long as the radiations from the radioactive isotope are not sufficiently intense to produce pathologic changes. The minute amount necessary to be detectable does not interfere with physiological processes in the animal. Thus radioactive phosphorus deposited in bone will behave like ordinary phosphorus. Other radioisotopes already used are sodium, calcium, strontium, fluorine, chlorine, iodine, carbon, plutonium, uranium, americium and gallium.

"The applications of radioautographic techniques to bone physiology are many. It is possible to localize the uptake of a radioisotope in bone inasmuch as there is a reliable relationship between the bone specimen and the radioautograph. . . .

"The analysis of many deformities can be aided greatly by the application of the methods . . . described for the study of the growth of bones. . . . In the study of sutural growth of the face in monkeys, radio-opaque markers were inserted on each side of a suture. The distance between the pegs was measured at the beginning and the end of the experiment. From these measurements it was found that growth does occur at a suture and the amount was accurately determined. By taking serial cephalometric roentgenograms the amount of separation of the pegs could be determined at any time during the experimental period without sacrifice of the animal. It was also possible to check the accuracy of the measurements of the separation of the pegs in the roentgenographic and the gross methods. The roentgenographic method, in addition, gave in-

formation in regard to direction of growth. It might be possible to obtain more accurate measurements of rate of growth of bone at a suture if the above methods were utilized in animals injected with alizarine red S.

"Problems of Facial Growth"

"*1. Anodontia.* The importance of the deciduous and permanent teeth in the development of the face and jaws has been a controversial problem for a long time. Fortunately it was possible to study facial development in a boy with complete anodontia by means of superposed tracings of serial cephalometric roentgenograms. An early report (up to five years of age) indicated that growth was within the lower limits of normal and that complete absence of the teeth does not significantly impair development of the face and jaws.

"The patient has been observed for an additional 10 years by means of serial cephalometric roentgenograms and the indications are that facial development is within normal limits. It is interesting to note that the first set of artificial dentures was supplied when he was five years old and since then because of growth of the jaws new dentures have been made at periodic intervals. . . .

"In progressive facial hemiatrophy one-half of the face in the region of the distribution of the trigeminal nerve is affected. This condition usually begins before puberty and continues into adulthood. It is characterized by a progressive atrophy of the skin, subcutaneous fat and connective tissue proper, muscle, cartilage and bone. In addition to the face, the tongue and soft palate are affected. Although no specific etiology can be ascribed to this condition, a history of previous trauma or infection in this area is often elicited. Some believe it to be related to the cervical sympathetic nervous system.

"It would have been valuable to have had serial photographs, dental casts and cephalometric roentgenograms to follow the progress of this condition. How early is the bone affected? Does it continue to grow and if so at what rate? What is the fate of the bones on the affected side after adulthood is reached? From an experimental point of view it would be interesting to try to confirm some of the speculation in regard to etiology. Are trauma, infection or the cervical sympathetic nervous system important factors? The use of x-rays, gross studies, implants and vital staining would help answer some of these questions.

"Problems of Maxillary Growth"

"Probably the most common and difficult maxillary deformity to cope with is that of the patient with a cleft palate and arrested growth of the middle-third of the face. The affects of various surgical operations on the cleft palate in regard to facial development of the child have been given considerable attention. Generally, the consensus is that the severity of the growth arrest of the middle third of the face is dependent upon the time and type of operation. A great deal of controversy exists, however, in regard to when the cleft palate should be closed and by what surgical or prosthetic procedures. Unfortunately many of the opinions expressed are based upon "clinical impressions" which are not usually substantiated by accurate measurements.

"How do the patterns of facial growth and development of normal individuals compare with those with unoperated palatal clefts and those with surgically closed palatal clefts? In order to answer some of the perplexing questions of the cleft palate problem, application of the scientific method to properly controlled studies is essential. The clinical use of serial cephalometric roentgenograms, dental casts, photographs and direct measurements are important. Such studies are in progress.

"Problems of Mandibular Growth"

"Generally mandibular growth deformities can be classified into those in which the mandible is larger or smaller than normal. Although the deformity is frequently bilaterally symmetrical, unilateral disturbances are not uncommon.

"The patient with a prognathous mandible usually presents himself for cosmetic treatment of his deformity. Although the lower jaw may jut considerably and masticatory function may be greatly impaired, the patient is more concerned with his appearance. In some rare instances the mandible is normal until pituitary dysfunction stimulates the condylar growth center (acromegaly, giantism) and leads to an overgrowth and a characteristic prognathism. In the majority of prognathic mandibles, however, no definite etiologic factors have been implicated. In addition to these bilateral overgrowths, unilateral overgrowth of the mandible is seen in patients with a benign hyperplasia or tumor of the mandibular condyle.

"The underdeveloped mandible like the overdeveloped one is usually caused by a disturbance of the condylar growth center. Congenital deficiency of or injury to the growth center as a result of trauma, radiation or inflammation will result in lack of growth unilaterally or bilaterally.

"Ideally, treatment should be based upon removal of the etiologic agent. Unfortunately, however when the patient is seen initially either the etiologic agent has been active for so long a time that a permanent deformity has been produced or the etiologic agent cannot be discovered. If surgical correction is undertaken by altering the position of the jaws in a young individual with an underdeveloped mandible, the growth centers must not be disturbed or an additional deformity may be superposed upon the old one. In the adult this is not a problem. In growing patients with mandibular prognathism it is theoretically possible to produce an arrest of growth of the mandibular condyles and thus permit growth of the remainder of the face to catch up with the mandible.

"The methods . . . described for the assessment of bone growth can be utilized in the study of patients with mandibular deformities in order to obtain additional information. Serial photographs, dental casts and x-ray headplates may indicate when and if a particular surgical procedure should be undertaken. From an experimental point of view x-ray, gross and vital staining studies have added to our knowledge. . . ."

News and Notes

American Association of Orthodontists

The next meeting of the American Association of Orthodontists will be held at the Baker Hotel, Dallas, Texas, April 26 to 30, 1953.

The work of the Program Committee is developing nicely. There will be many important essays on timely subjects, presented by capable speakers. A large number of experienced clinicians will present practical technical advances and exhibit results of their clinical practice.

The usual special features of Sunday Buffet Supper, Stag Dinner, and International Luncheon are being prepared. The President's Banquet with entertainment and dancing will climax the social activities.

There will be exhibits by the dental dealers and manufacturers.

The Ladies' Entertainment Committee is preparing a splendid program. Bring the ladies.

The Local Arrangements Committee is making every effort possible to promote adequate and efficient conduct of the meeting and for your convenience.

There will be a comprehensive exhibit of material submitted in 1952 by applicants for certificates of the American Board of Orthodontics.

Make your reservations now at the Baker Hotel.

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Baker Hotel, Dallas, Texas, April 22 to April 26, 1953. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Mich. To be considered at the Dallas meeting, all applications must be filed before March 1, 1953.

Great Lakes Society of Orthodontists

The Annual Meeting of the Great Lakes Society of Orthodontists was held at the Royal York Hotel, Toronto, Ontario, Canada, Nov. 10, 11, and 12, 1952. President Holly Halderson wielded the gavel for the presentation of the following program:

MONDAY, NOV. 10, 1952

Morning

Registration.
Table Clinics.

Afternoon

Society Luncheon.
Speaker: Dr. Sidney Smith, President, University of Toronto.
Business Session.
Dr. Kyrle W. Preis. Habits Detrimental to Normal Facial Growth.
Dr. C. H. M. Williams. A Concept of the Physiology of the Human Dentition.
Question and Answer Forum.
Past President's Dinner.

Evening

The Grieve Lecture. Dr. Spencer R. Atkinson, under the auspices of the Orthodontic Section, Canadian Dental Association.

TUESDAY, NOV. 11, 1952

Morning

Dr. John R. Thompson. The Use of the Cephalogram in Diagnosis.
Dr. Gordon C. Swann. The Diagnosis and Interception of Class II Malocclusion.
Dr. John R. Thompson. Variations in Facial Growth Patterns.
Question and Answer Forum.
Luncheon.
Business Session.

Afternoon

Hospital for Sick Children

Dr. A. L. Chute. Endocrines in Growth.
Dr. S. A. Mac Gregor. Pedodontist's Responsibility in Incipient Malocclusion.
Question and Answer Forum.
Tour of the Hospital and Afternoon Tea.
President's Reception and Dinner.

WEDNESDAY, NOV. 12, 1952

Morning

Dr. Charles R. Baker. The Selection of Cases for Treatment in the Deciduous Dentition.
Dr. Spencer R. Atkinson. The Selection of Cases for Treatment in the Mixed Dentition.
Business Session and Installation of Officers.
Adjournment.

ROBERT E. WADE, PROGRAM CHAIRMAN.

Rocky Mountain Society of Orthodontists

The annual fall meeting of the Rocky Mountain Society of Orthodontists was held in Denver, Colo., on Nov. 10 and 11, 1952.

The program is as follows:

Monday, Nov. 10, 1952

8:30-9:00	Registration—Study club rooms of the Denver Dental Association, Denver General Hospital.
9:00-12	Dr. R. Paul Husted. Orthodontic Diagnosis and Treatment of Primary and Mixed Dentures.
12:30-1:30	Luncheon—Denver Press Club.
1:30-2:45	Mr. Alan S. Richardson. No Man Need Die Poor in a Capitalistic Economy.
3:00-4:00	Dr. R. Paul Husted. Positioners—Their Uses and Technique for Their Construction.

Tuesday, Nov. 11, 1952

8:45—12	Dr. R. Paul Husted. Clinical Demonstration of Method of Properly Relating Models.
12:30-2:30	Luncheon—Panel Discussion, Denver Press Club Dr. R. Paul Husted Dr. Harold E. Rice

Dr. J. Lyndon Carman
Dr. George H. Siersma, Moderator

2:45-4:30 Dr. R. Paul Husted. Management of the Younger Patients in an Orthodontic Practice.

4:30-5:00 Society Business Session.

Pacific Coast Society of Orthodontists

The Twenty-third General Meeting of the Pacific Coast Society of Orthodontists will be held at the Palace Hotel, San Francisco, on Monday, Tuesday, and Wednesday, Feb. 23, 24, and 25, 1953.

The Denver Summer Seminar for the Advancement of Orthodontic Practice and Research

The fifteenth Annual Denver Summer Seminar completed a very successful session at the Park Lane Hotel in Denver, Colo., from Aug. 3, through Aug. 6, 1952.

Dr. Sam Gore again demonstrated the fabrication and use of the removable appliance, and with becoming modesty summarized his discussion by stating that it was not so much the appliance that treated cases successfully, it was knowing where to place the pressure and how much. The removable appliance features the principles of light, intermittent pressures which Dr. Albin Oppenheim stressed during the 1945 Seminar. "Appliances do not get results; osteoblasts do the work." Dr. Gore was assisted by Dr. Archie B. Brusse and Dr. William Roy Humphrey who have modified the removable appliance by fabricating it with chrome alloy. Dr. Humphrey demonstrated his adaptation of acrylic bite planes to the Crozat appliance. Since the Seminar was among the first to stress the importance of the removable appliance introduced by Dr. Sam Gore at its 1944 meeting, it was gratifying to note growing interest and its increased use.

Dr. Hermann Becks, a charter member who was present at the first Seminar meeting in 1936, was again invited to discuss (1) root resorption, (2) role of pituitary in bone growth and development, and (3) "Can we prevent or control dental caries?" Much credit is due Dr. Becks, whose enthusiastic support through the years contributed a great deal to the successful growth of the Seminar.

Dr. Isaac Schour, who also appeared at the 1944 Seminar, was again invited to discuss biology and physiology of the supporting structures of the teeth.

Dr. Harvey Stallard, eminent authority on pressure habits, lectured to the members of the Seminar on gnathology.

Dr. Leo Shanley, St. Louis, a former Seminar member, and Dr. H. C. Pollock, Editor-in-Chief of the AMERICAN JOURNAL OF ORTHODONTICS, visited the Seminar for a few discussion sessions. Dr. Pollock was called on for a few remarks and expressed helpful and thought-provoking ideas for which he is noted. He paid tribute to the Denver Summer Seminar which was originally organized in 1936 by students and friends of the late Dr. Albert H. Ketcham for study of the basic sciences in the advancement of orthodontic practice and research. It is dedicated to Dr. Ketcham's memory and has been meeting each year since its conception, except 1946 when it was not held due to the fact that the American Association of Orthodontists was holding its National meeting in Colorado Springs, Colo.

Drs. Archie B. Brusse, J. Lyndon Carman, William Roy Humphrey, and Charles M. Waldo conceived the idea of the Seminar. These men are the founders and they are now honorary members of the Denver Summer Seminar.

The Seminar plan represents an attempt to learn through the combined efforts of the whole group rather than that of one man as instructor. Organized material is presented in each section by a leader who acts as chairman in the subsequent discussion. It is to be expected that certain members of a group may have new or additional information, and that these men will give the group the benefit of their knowledge and experience. Ample time is allowed for discussion and all members of a group are expected to take part in offering their knowledge or criticism in an attempt to cover each subject as thoroughly and carefully as possible. With the cooperation of those participating, this plan provides a most advantageous consideration of each subject and an unusual freedom from prejudice and dogma.

It is the intention that both lectures and demonstrations will present clear-cut procedures, whenever possible, and show how these procedures may be applied in the everyday practice of orthodontics.

One of the most profitable and important features of each Seminar is the custom of having members bring in casts of orthodontic cases, which are not necessarily their best-treated cases, but rather cases that have presented some particular problem in treatment. In a friendly, frank examination of treated cases, improvements in technique, useful ideas and new hints in appliance construction are always the ultimate result.

It is the intention that the program from year to year shall be essentially a flexible one, changing to follow the trend of orthodontic thought and progress. Group leaders have always been chosen from the outstanding men in orthodontics and related professions. With the growth of the Seminar and its enthusiastic reception by those attending, the scope of each succeeding program has been broadened to include new leaders and material. A partial list of discussion leaders who have appeared at the Denver Summer Seminar are: Drs. Albin Oppenheim, Bernhard Gottlieb, Harry Sicher, Spencer R. Atkinson, C. F. Stenson Dillon, Allan G. Brodie, Byron O. Hughes, George R. Moore, Joseph D. Eby, Charles M. Waldo, Charles H. Tweed, Joseph E. Johnson, Oren A. Oliver, Sam Gore, W. M. Krogman, Hermann Becks, Isaac Schour, Brooks Bell, William Roy Humphrey, George H. Siersma, Archie B. Brusse, Martin Palmer, Bradford Murphey, Wendell L. Wylie, C. Richard Horwedel, Edward A. Cheney, Malcolm R. Chipman, J. A. Salzmann, Balint Orban, Henry Glupker, and many others.

Colorado, in addition to offering ideal conditions for a summer meeting, is well known as one of the favorite vacation spots of the country, the Switzerland of America, and many Seminarians take advantage of the opportunities for recreation by planning a vacation either before or after the Seminar.

One of the entertainment high lights that is enjoyed by the Seminarians and their wives is a drive into the mountains to historic Central City, the richest square mile on earth, for a rainbow trout dinner at the Teller House and attendance of a play in the Opera House. The production this year was Helen Hayes and her entire cast from Broadway, New York City, in "Mrs. McThing."

The Denver Summer Seminar is definitely not a course for the preparation of those not already orthodontists. Requirements for participation include membership in the American Association of Orthodontists. In the best interests of all concerned the group is limited to thirty members. There is a waiting list, applications of previous Seminar members receive preference.

Israel Orthodontic Society

Dr. H. E. Jerrold and Dr. J. C. Lifton, of New York, gave lectures and demonstrations during the past summer before the members of the Israel Orthodontic Society. Dr. Jerrold and Dr. Lifton were made corresponding members of the Israel Orthodontic Society.

Negotiations With the Counsel of the Federal Trade Commission

General Dargusch, the Counsel of the American Association of Orthodontists, is reported to be negotiating a consent decree with the Counsel of the Federal Trade Commission.

The hearing, set for Oct. 8, 1952, in Pittsburgh, was postponed pending the outcome of the present negotiations before the Federal Trade Commission.

The following is a copy of a letter mailed to the active membership of the American Association of Orthodontists and the letter explains itself.—*Ed.*

THE AMERICAN ASSOCIATION OF ORTHODONTISTS

September 29, 1952

Dear Fellow Member:

Due to the widespread confusion among our members concerning the complaint against the American Association of Orthodontists by the Federal Trade Commission, your Ad Interim Committee meeting in St. Louis, decided that each member, since each member is involved, should be better advised of the situation.

On or about August 4, 1952 the Federal Trade Commission served a complaint dated July 22, 1952 on the officers and directors (as of April, 1951) of the American Association of Orthodontists. The complaint alleged that the respondents (the American Association of Orthodontists, its officers, directors and members and T. Wallace Sorrels) had:

1. Acted to prevent competitors from having free access to media of advertising serving the dental profession;

2. Acted to prevent sellers of supplies and equipment used by dentists and dental laboratories, from having access to media of advertising serving the dental profession;

3. Acted to coerce and compel, by various means, publishers and editors of trade publications in the dental and orthodontic field from soliciting or publishing advertising from non-members of said respondent association;

4. Used respondent association as an instrumentality or medium for carrying on and making effective our aforesaid complaint.

The Ad Interim Committee, after careful deliberation, retained General Carlton S. Dargusch, Attorney, of Columbus, Ohio, to negotiate a satisfactory settlement in the interest of the officers, directors and members of the American Association of Orthodontists and the dental profession as a whole.

Your Ad Interim Committee and other members of the A.A.O. appeared before the Board of Trustees of the American Dental Association in St. Louis on September 5 and 6 and discussed the complaint filed by the Federal Trade Commission against the A.A.O. with regard to the effect that this matter would have upon the professional status of the dentists and our ability to serve the public.

The complaint contained a proposed Cease and Desist Order, the language of which, by inference, was unduly detrimental to the respondents as well as the entire dental profession.

Our counsel has been able to have the Cease and Desist Order modified and on the basis of the modified order, the unanimous vote of the Ad Interim Committee at a meeting held by conference telephone, the approval of Dr. Fred Aldrich, Chairman of the Public Relations Committee of the A.A.O. and the proper

authorities of the American Dental Association has entered into an agreement for a consent settlement with counsel for the Federal Trade Commission. The consent settlement will become final on approval by the Federal Trade Commission which should be forthcoming in the next thirty to sixty days. The hearing scheduled for October 8 has been postponed pending the acceptance of the consent settlement by the Federal Trade Commission.

It should be borne in mind that in entering into the consent settlement we were not obliged to admit or deny any of the allegations of the complaint except that the Federal Trade Commission has jurisdiction to decide this case.

We quote General Dargusch, "I assume that each of you wonders what effect this has on you personally. This order does apply to you as an individual orthodontist; and since it does, I feel that you should be reminded that your Board of Directors at the 1951 meeting passed a resolution which requires all complaints pertaining to laboratory advertising be channeled through the Chairman of the Public Relations Committee. Such procedure should be followed, as it will be in compliance with the Cease and Desist Order. The Public Relations Chairman has been directed to forward any complaints to the Federal Trade Commission which he deems worthy of their attention."

You will be notified when the Cease and Desist Order becomes effective.

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James W. Ford
Brooks Bell
Public Relations Chairman
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American Orthodontists Honored

Two American orthodontists were honored recently by being elected to honorary membership in the British Dental Association. They are Dr. Andrew F. Jackson, of Philadelphia, member of the American Dental Association Council on Dental Education, and Dr. Oren A. Oliver, of Nashville, former American Dental Association president and a member of the Council on International Relations.

Universitiy of Pennsylvania

The Thomas W. Evans Museum and Dental Institute of the School of Dentistry, University of Pennsylvania, Philadelphia, Pa., will give a postgraduate course on the philosophy and principles of the Universal appliance. The course will be conducted by Spencer R. Atkinson from April 13 to 18, 1953.

A course on the twin wire mechanism will be given by Joseph E. Johnson, April 6 to 10, 1953, at the University of Pennsylvania.

University of Toronto, Faculty of Dentistry

The University of Toronto, Faculty of Dentistry, is offering a continuation course in cephalometrics during the three-day period, Jan. 26 to Jan. 28, 1953.

Navy Dental Corps Observes Fortieth Anniversary of Establishment of Naval Dental Service

Aug. 22, 1952, was the fortieth anniversary date of the passage by the Congress of the Act which authorized the appointment of not more than thirty assistant dental surgeons to be a part of the Medical Department of the United States Navy and to serve professionally

National Naval Medical Center, Bethesda, Md. The present site of the Naval Dental School.

the personnel of the naval service. This Act, therefore, actually and officially authorized the establishment of a dental service for providing dental care for Navy and Marine Corps personnel by naval dental officers.

American Dental Association

Indications that 72 per cent success can be obtained in saving teeth that are abscessed and decayed to the pulp were reported by Dr. Donald B. Chatterton, of San Diego, Calif., in *The Journal of the American Dental Association.*

Dr. Chatterton, a member of the faculty of the University of Southern California School of Dentistry, based his report on a two-year study in which 377 teeth with exposed pulps were treated.

In a technique known as pulp curettage, the exposed portion of the pulp was removed, the remainder was medicated, and the cavity was then filled.

Dr. Chatterton said that because his practice was in San Diego where Navy men and their families were constantly shifted in and out, he was able to recall for checkups only 71 of the 377 cases treated.

On the basis of at least a year's observation of the cases, however, 72 per cent success in treatment was indicated, he said.

Dr. Chatterton reported that 51 of the 71 teeth treated remained in good serviceable condition.

He cautioned, however, that more study was needed.

"Further refinement in diagnostic methods, prior to the initiation of treatment, is warranted to determine the real values of this procedure," he said.

The habit of grinding the teeth is widespread and injurious to dental health, according to Dr. Arthur F. Schopper, of Kansas City, Mo.

Writing in *The Journal of the American Dental Association,* Dr. Schopper, a trustee of the A. D. A., said most people grind their teeth while sleeping. The habit if unchecked causes the teeth to chip and loosen and makes for considerable erosion and sensitiveness of the gums, he said.

For prevention of the habit in severe cases, Dr. Schopper recommended a retaining appliance designed to keep the dental arch in place after correction of tooth irregularities. Use of the appliance has preserved teeth for many years, he said.

Dr. Schopper reported he had found in his practice that the appliance can be used by most persons except those who have an open-bite and are unable to bring their upper and lower front teeth together.

For those having an open-bite, Dr. Schopper suggested use of bite blocks between the upper and lower rear teeth to prevent grinding at night.

Discussing the relation between partial dentures and the mouth tissues, he said removable bridges were most valuable to a patient and fixed bridges were rarely indicated.

When a person loses a tooth and there are indications he will lose others or all of his remaining teeth soon, a removable restoration can be made for the first tooth lost and teeth added to it as they are needed, he said.

Dr. Schopper suggested that more emphasis should be placed on preventive dental care.

He said, "Care of the teeth by a dentist must start early in life, not only to prevent the necessity of mouth reconstruction but also to avoid the expense of such dental service." He added:

"An educational program should be developed to reach persons of all ages in every walk of life. Personal effort should be concentrated on diet and mouth hygiene, public effort on the fluoridation of communal water supplies.

"If dental health education is begun at an early age and reinforced by a public caries-prevention (tooth decay-prevention) program, dental disease will be reduced."

Announcement to Future Essayists

At the annual session of the American Association of Orthodontists in Louisville the following recommendations of the Publication and Editorial Board were adopted and are now official:

1. That many valuable articles are lost for publication because they were not prepared for such.
2. Authors expecting to have published, without expense, a profusion of illustrations impose a difficult task upon the editorial staff.
3. That the A.A.O. should adopt official instructions for essayists, including all constituent societies, as to the manner in which their manuscripts should be prepared for publication first and for presentation second.

The contract between the American Association of Orthodontists and The C. V. Mosby Company includes a stipulated sum to be spent for the illustrations of acceptable articles for publication. Any excesses of this budget must be paid out of the treasury of the A.A.O. and may become dangerously expensive.

Accordingly the A.A.O. passed a resolution in 1949 limiting the cost of illustrating any one article appearing in the JOURNAL. In the exercise of these instructions, the Editorial Staff of the JOURNAL has been most lenient and considerate, but the budget must be held within its limit. Excess costs of illustrations may be paid by the authors or other outside sources, if desired.

Avoid delay in the publication of your essay by limiting illustrations.

GEORGE R. MOORE, Secretary-Treasurer, A.A.O.
S. J. KLOEHN, Chairman, Publication and Editorial Board, A.A.O.

Notes of Interest

Joseph E. Bernstein, D.D.S., announces that he is now engaged in the exclusive practice of orthodontics at 426 Medical Arts Bldg., 16th and Walnut Streets, Philadelphia, Pa.

Wayne L. Zeiger, B.S., D.D.S., M.S., announces the removal of his offices to 111 North Ninth St., Las Vegas, Nev., practice limited to orthodontics.

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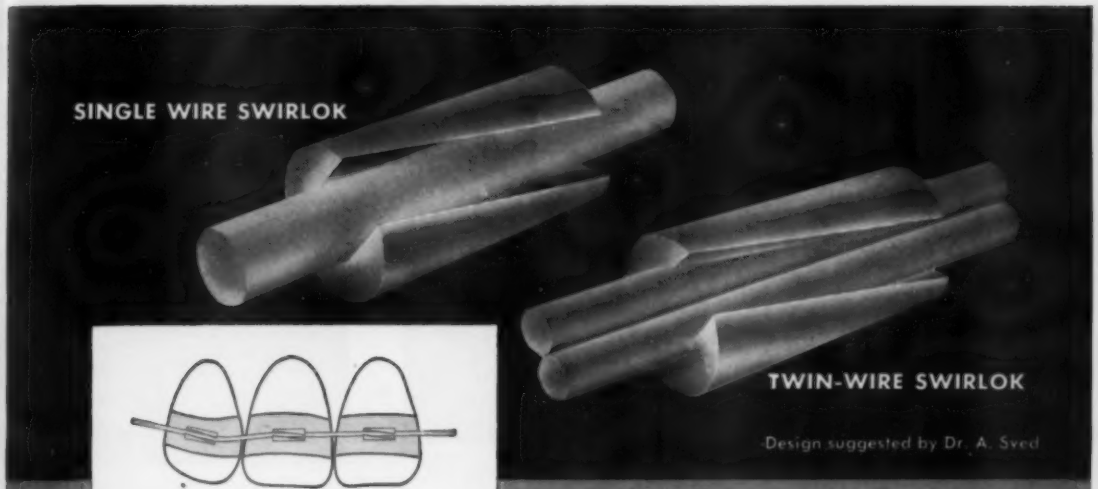

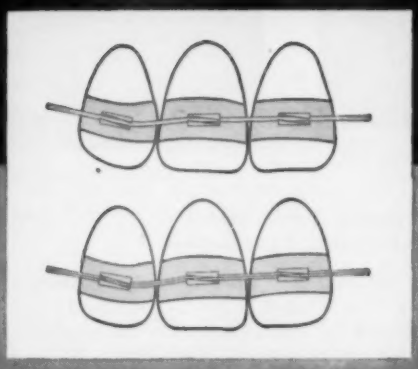

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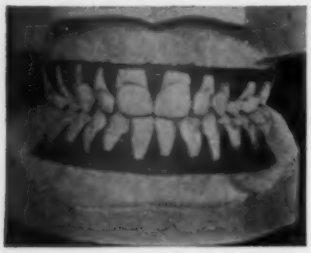

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$2.40 per dwt.

ALL MADE IN POPULAR GAGES AND WIDTHS

Prices subject to change

THE S. S. WHITE DENTAL MFG. CO., 211 S. 12th STREET, PHILADELPHIA 5, PA.